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GRAPES

FOR DIFFERENT REGIONS

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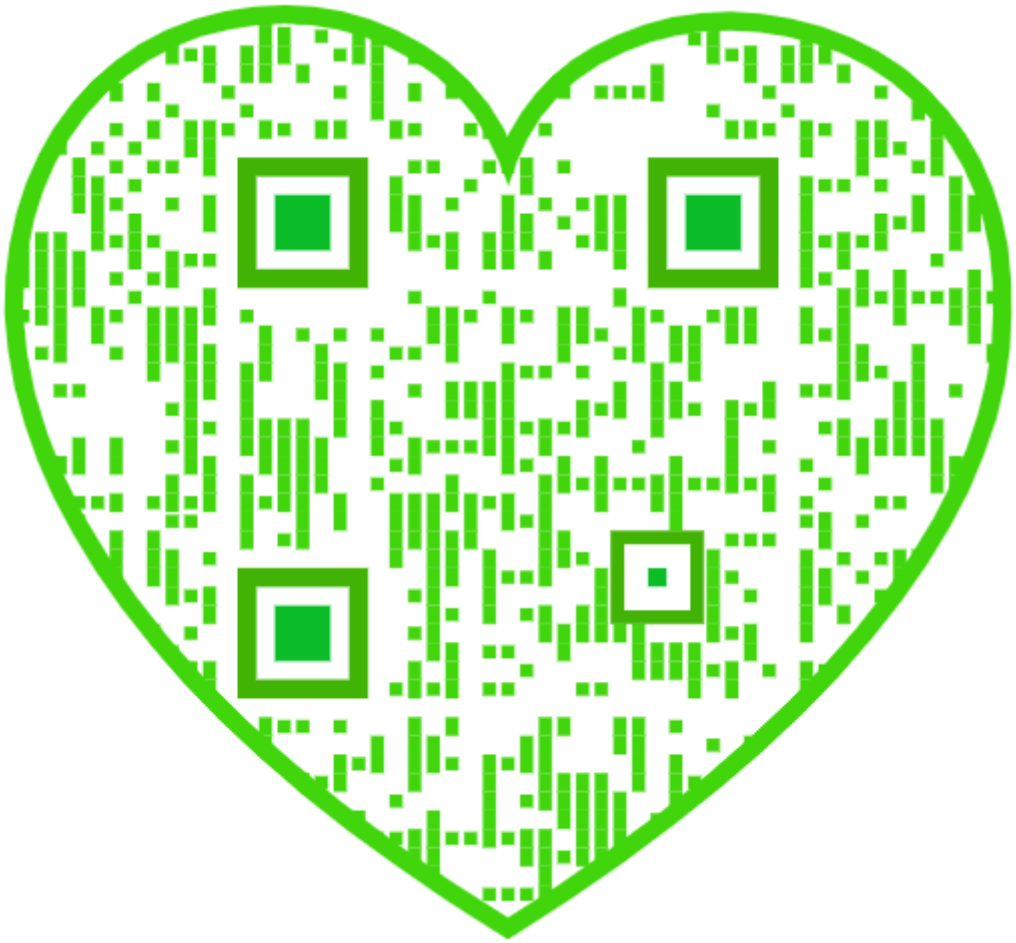

GRAPES are among the most important fruit crops. They are high in food value and essential minerals as well as outstanding in taste appeal. Dried as raisins, they constitute an important concentrated food; manufactured into jams, jellies, and other table delicacies, they hold a high place in army camps, hospitals, and homes; and the unfermented and fermented juices are leading beverages.

Old World, or vinifera, grapes constitute by far the major production of grapes in the Western States; they are grown principally in California. Native American grapes are much more widely distributed and more widely adapted to various parts of the country. These have been developed in part from native wild species and in part through cross breeding with Old World varieties.

Owing to the great diversity in climate and other environmental conditions, grape varieties are not equally well adapted to all parts of the country; study has shown that the United States may be divided into nine regions within which specific varietal groups are most likely to thrive. Among the most important factors determining the limits of these regions are the severity of winter temperatures, the length of the growing season, the amount of annual rainfall, the level of prevailing temperatures, the relative atmospheric humidity during the growing season, and the susceptibility of different varieties to fungus diseases and insect pests. This bulletin discusses the importance of these factors in grape growing, describes and illustrates the different types of grapes, gives brief descriptions of all varieties suggested for growing in different parts of the country, and by a carefully prepared map shows the regions where the different varietal groups are most likely to succeed.

This bulletin supersedes Farmers' Bulletin No. 1689, Grape Districts and Varieties in the United States.

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GRAPES FOR DIFFERENT REGIONS

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GRAPE GROWING is widely practiced in the United States. Grapes are produced commercially in 44 States and on a farm-home scale in every State in the Union. The yearly production for the period 1919–39 averaged somewhat more than 2,000,000 short tons, representing for the last 16 years of that period an annual farm value of approximately $49,000,000. California leads all other States in gross tonnage, with about 90 percent of the total, while New York, Michigan, Ohio, and Pennsylvania are the heaviest producing States in the eastern and central parts of the country. There are important production areas also in Arkansas, Missouri, North Carolina, Illinois, and other States. The location of the grape-growing centers and the relative production of each are indicated in figure 1.

Three main types of grapes are grown: (1) The vinifera, European, or Old World, type—represented by the table, raisin, and wine grape varieties, grown principally in California but to some extent in other States; (2) the native American bunch-grape type, grown primarily in the regions east of the Rocky Mountains and in the Pacific Northwest; and (3) the muscadine group, widely grown in the South.

As great variations in climate, soil, and other natural conditions exist in this country, marked differences in the adaptation of grape types and varieties accordingly are found. In the selection of varieties for planting in any particular locality, therefore, it is highly desirable to know not merely what the character of the different grapes may be when grown under favorable conditions, but particularly which varieties are most likely to succeed there. The object of this bulletin is to assist in this selection by making clear some of the factors affecting varietal adaptation, by giving some consideration to the characteristics of the different grapes themselves, and by showing on

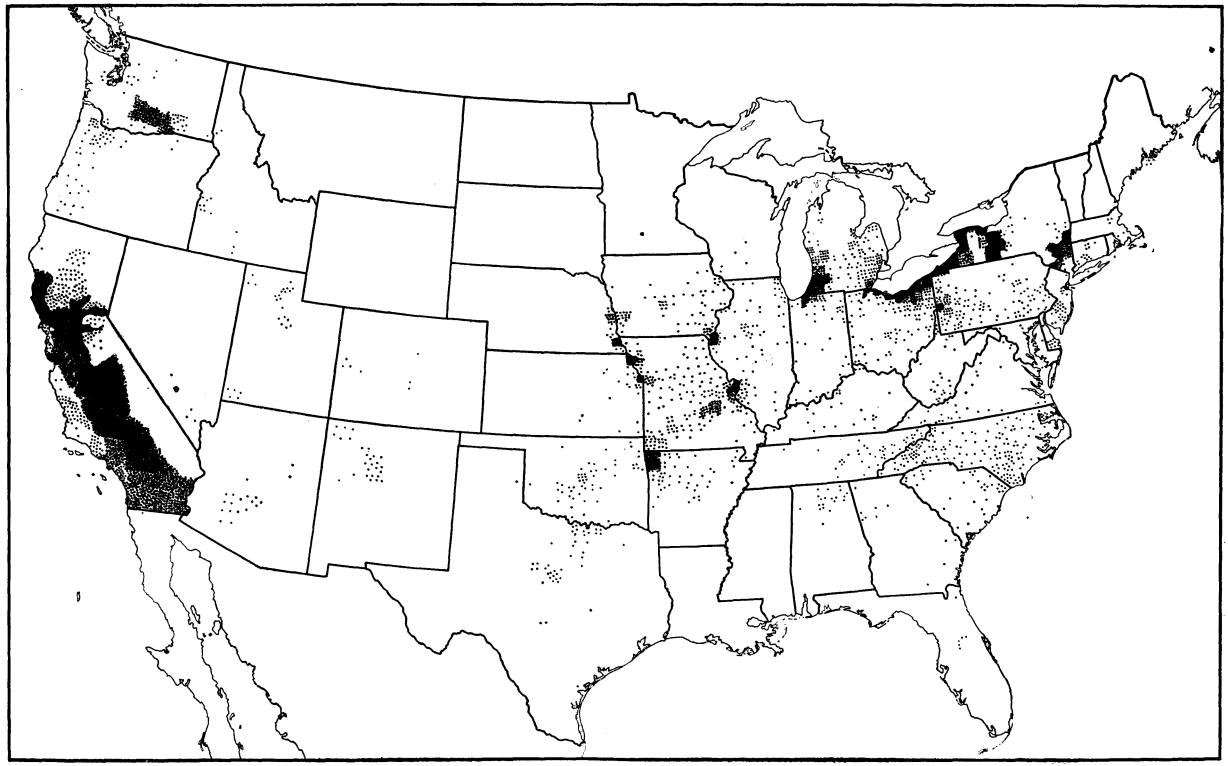

FIGURE 1.—Map of the United States showing grape-growing centers in 1939 (from Sixteenth Census figures). Each dot represents 50,000 pounds.

a carefully prepared map the regions where definite varietal groups have by experience been found best adapted.[1]

NATIVE GRAPE SPECIES

There are about 30 native species of wild grapes growing over more or less extensive areas, and a number of these have played important roles in the grape industry of the United States as well as in that of Europe. Representatives of some of these have been grown extensively as standard varieties, while cross breeding between native species, hybridizing with different representatives of *Vitis vinifera* L., and interbreeding with grapes thus derived have given rise to many of the American grape varieties. The wild species have also been important in grape culture, either as pure species or as hybrids developed for rootstock purposes. Because of their inherent resistance to certain destructive insect pests and their adaptation to specific regions they have often been found invaluable where own-rooted vines have failed.

Among those native species that have proved most valuable may be mentioned six species of bunch grapes.

(1) *Vitis labrusca* L., the so-called fox grape. This occurs naturally in the eastern part of the country from central New England southward to Georgia and is occasionally found on the western slopes of the Allegheny Mountains. It has also been reported as occurring in limited districts in southern Indiana and central Tennessee. It has been used more extensively than any other American species in the development of standard varieties. The well-known Concord grape is a representative of this species.

(2) *Vitis riparia* Mihx., the so-called riverbank grape. This is the most widely distributed of the American species, its range extending from the St. Lawrence River and Lake Superior on the north into Virginia, Tennessee, Arkansas, and Texas on the south and from the Rocky Mountains eastward to the Atlantic Ocean. The adaptation of this species to such a wide range of natural conditions has made it particularly valuable in the development of varieties suited to various parts of the country, and representatives of this species and its hybrids have been widely used for rootstock purposes. Its relatively high sugar and acid content and the pure flavor of its fruit have given character to varieties adapted to jam, jelly, and beverage manufacture. Bacchus, Beta, Clinton, and other well-known varieties owe their character largely to *V. riparia* parentage.

(3) *Vitis aestivalis* Michx., known commonly in the South as summer grape and in the North as pigeon grape and winter grape. This species is native to the section of the country extending from the Mississippi River eastward and from New York southward to the Gulf. While it has not entered so extensively into the development of American varieties as some of the other species, owing primarily to its lack of hardiness and vigor in the northern parts of the country and to the small size of the berries, the high sugar content, sprightliness, spicy flavor, and deep color of the juice have made the varieties derived from this species particularly suitable for wine making. Its natural resistance to root ailments and its adaptation to regions where grape diseases are prevalent account for its value for rootstock purposes. The well-known varieties Norton and Cynthiana, thought by some to be identical, are representatives of this species.

(4) *Vitis rupestris* Scheele, commonly known within its range as the rock grape, July grape, and mountain grape. This species occurs naturally in a relatively narrow area extending from southwestern and central Texas in a northeastern direction through Oklahoma, the Ozark sections of northern Arkansas and southern Missouri, southern Indiana and Kentucky, and central Tennessee. It has also been reported as far east as southern Pennsylvania. Its principal use has been for rootstocks, either in the pure species form or as hybrids with other species. It has been used widely in Europe as well as in California and other States in which the European type of grape is grown, where it has been found valuable

[1] The writers gratefully acknowledge the generous cooperation of State and Federal horticultural workers throughout the country in making available the results of their observations and experience regarding the adaptation of grape varieties and types to the various regions.

because of its resistance to phylloxera. Rupestris St. George is one of the best known varieties of this species.

(5) *Vitis lincecumi* Buckl., the so-called post oak grape. This is native to eastern Texas, western Louisiana, Arkansas, southern Missouri, and Oklahoma and has been used in the development of varieties adapted particularly to the southern parts of the country, where many of the standard northern varieties do not thrive. Varieties having pure *V. lincecumi* origin are now found rarely, if at all, but earlier hybridization of this species with *V. labrusca*, *V. bourquiniana* Munson, *V. vinifera*, and other species have given rise to a number of well-known varieties, such as Bailey, Beacon, Ellen Scott, Extra, and Marguerite.

(6) *Vitis champini* Planch. This species has a restricted natural range, being confined principally to central Texas. While it has been used in the development of such varieties as Champanel, Lomanto, and Nitodal, it has found its greatest usefulness as the source of disease-resistant rootstocks; among these Barnes, De Grassett, Dog Ridge, Joly, Ramsey, and some unnamed stocks are included.

Several other species of American bunch grapes[2] used more particularly in the development of valuable rootstocks should be mentioned in this connection. These include *Vitis berlandieri* Planch., *V. candicans* Engelm., *V. cordifolia* Lam., *V. doaniana* Munson, *V. longii* Prince, and *V. monticola* Buckl. These are all native to southern or southwestern parts of the country.

Two other species of American grapes call for special mention: *Vitis rotundifolia* Michx. and *V. munsoniana* Simpson. These belong to an entirely distinct botanical group differing widely from the bunch-grape types mentioned above in character of vine and fruit. They do not hybridize readily with the bunch-grape species and do not form satisfactory graft unions with them. While not immune to some of the diseases to which the bunch grapes are subject, they do show considerable resistance to them; this makes them particularly valuable in sections of the South, where these diseases are prevalent.

(1) *Vitis rotundifolia*, known generally as muscadine and also as bullace grape and southern fox grape. The range of this species includes the Coastal Plain section of the Southeastern States, extending from Virginia to Florida, across the Gulf Coast States and down the eastern coast of Texas. In the eastern section this species reaches well up into the Blue Ridge Mountains, and in the Mississippi Valley it extends northward into southeastern Missouri and sections of Tennessee and Arkansas. In this species the fruit is borne in small clusters the individual berries of which ripen at different times over a considerable period. Most fruiting varieties now grown are self-sterile because their flowers are imperfect and must be pollinated by separate staminate, or male, vines. To assure a set of fruit, therefore, a certain proportion of male vines must be provided in the vineyard. Since the fruit must be harvested as single berries rather than in clusters and is subject to spoilage during handling and shipment, these grapes are better adapted to farm-home or small-scale growing than to large commercial planting. The high dessert quality of selected varieties in the fresh condition, as well as their suitability for the production of many culinary and beverage products, however, makes the muscadine grape an important fruit crop in the South. Many of the named varieties represent selections from vines originally growing wild, but considerable breeding work has been done, and desirable new varieties have been and are being developed. The standard muscadine varieties Scuppernong, Thomas, Hunt, James, and others represent this species.

(2) *Vitis munsoniana*, the so-called bird grape, or everbearing grape, of the Gulf region, to which it is native. The importance of this species in the present connection is derived not from its inherent value as a fruit, but from the fact that through the cross breeding of selected varieties of *V. rotundifolia*

[2] Owing to doubt as to the original source of the important *Vitis bourquiniana* species, it is not included here.

with representatives of this species, perfect-flowered, self-fruitful hybrids have been produced; these show much promise for the development of muscadine varieties having not only superior vine and fruit characters, but also the ability to produce abundant crops without the use of unproductive male vines. There are no named varieties of *V. munsoniana.*

THE VINIFERA, OR OLD WORLD, GRAPE

The vinifera, European, or Old World, grape, the various forms of which have been grouped under the species *Vitis vinifera*, is of somewhat doubtful lineage. It is believed to have originated in the region south of the Caspian Sea in Asia Minor, and thence it has been widely disseminated. Varieties derived from it are grown commercially between 20° and 51° N. latitude and between 20° and 40° S. latitude. Vinifera grapes not only furnish the major world production, but, as previously mentioned, they have also played a vital part in the improvement of native American types. The cultural range of vinifera grapes is limited mainly by climatic factors. They require a long growing season, relatively high summer temperatures, low atmospheric humidity, a ripening season free from rain, and mild winter temperatures. The numerous varieties furnish fruit types ranging from the small-berried currant grapes and the medium-sized fruit of the wine varieties to the large-berried table varieties.

The more important commercial and special types of vinifera grapes grown in the United States are described briefly on pages 31 to 38.

Vinifera varieties may be divided into three main types (raisin, table, and wine), but some varieties may be used for all three products.

RAISIN VARIETIES

Over 99 percent of the acreage of grapes grown in the United States for the production of raisins consists of the following varieties, named in the order of their importance: Sultanina (Thompson Seedless), Muscat of Alexandria, Sultana, and Corinthe Noir (Zante Currant).

TABLE VARIETIES

The following varieties constitute over 95 percent of the vinifera table grape acreage in this country: Sultanina (Thompson Seedless), Flame Tokay, Emperor, Malaga, Olivette Noire (Cornichon), Castiza (Red Malaga; Molinera), Ohanez (Almeria), Alphonse Lavallee (Ribier), and Muscat of Alexandria. In addition, many other varieties are grown on small acreages or for local and home use. Some of these are included in the following list: Agadia, Black Hamburg, Black Monukka, Black Morocco, Danugue (Gros Guillaume), Dattier de Beyrouth (Rosaki), Dizmar, Gros Colman (Dodrelabi; Fresno Beauty), Kahallillee, Kandahar, Muscat Hamburg, Olivette Blanche, Olivette de Vendemian, Perle de Csaba, Prune de Cazouls, Rish Baba, and Verdal (Aspiran Blanc; Servan Blanc).

WINE VARIETIES

The wine varieties grown are more numerous than the varieties in either of the other groups. More than 90 percent of the acreage is made up of the following varieties: Zinfandel, Carignane, Alicante

Bouschet, Mission, Muscat of Alexandria, Petite Syrah (Duriff; Serine), Palomino, Feher Szagos, Grenache, Cinsaut (Black Malvoisie), Burger, Colombar (erroneously known as Sauvignon Vert), Semillon, Cabernet Sauvignon, and Sylvaner. In addition, the following varieties are less extensively grown: Aleatico, Alicante Ganzin, Aramon (Burkhardt), Barbera, Beclan, Chasselas Doré (Gutedel; Golden Chasselas), Grand Noir, Green Hungarian, Grignolino, Lenoir (*Vitis bourquiniana*), Mondeuse (Gros Syrah), Muscadelle du Bordelais, Muscat de Frontignan (Muscateller), Pedro Ximines, Petit Bouschet, Pinot Blanc, Pinot Noir (Black Pinot), Refosco (Crabb Black Burgundy), Salvador (direct producer), Sangioveto, Saint Macaire, Sauvignon Blanc, Tannat, Trousseau, and Valdepenas.

FACTORS AFFECTING VARIETAL ADAPTATION

The species composition of grape varieties has an important bearing on their adaptation to various sections of the country, because this determines the character of growth of the vine, its hardiness, earliness or lateness of flowering and maturing its fruit, resistance to fungus diseases and insect pests, tolerance to drought, and other inherent properties.

There are a number of other factors, concerned primarily with environmental conditions, that affect varietal adaptation. Among these may be mentioned (1) the severity of winter temperatures, (2) the length of the period from the last killing frost in the spring to the first killing frost in the fall, (3) the amount, seasonal distribution, and availability of moisture, (4) the average temperature level of the growing season, (5) the physical and chemical character of the soil, (6) the relative humidity of the air during the growing season, (7) the amount and quality of sunshine, and (8) the latitude, which determines the day length and season as well as the period of winter dormancy.

In some areas the severity of winter cold precludes the growing of any grapes at all, and even in more favored locations it sharply restricts the types and varieties that can be grown successfully. This applies particularly to the northern parts of the country and to the higher elevations, but winter killing of vines is by no means confined to these areas.

The most important other single factor determining varietal adaptation, particularly in the northern parts of the country, appears to be the length of the period free from killing frosts. None of the standard varieties are able to mature a crop in a period less than 90 days free from killing frosts; and in regions having a growing season of 90 to 150 days, only the most hardy varieties thrive. With the exception of those varieties derived largely from southern species, most of the standard varieties succeed best where the frost-free period is 150 to 180 days. They may grow and produce crops in regions having longer growing seasons, but there is an increasing tendency, as they are grown farther south, for the berries to mature unevenly in the cluster and for the vine to become gradually weaker and to die while it is still relatively young. Other factors than the length of the frostless period are operative here also, and it is often difficult, if not impossible, to judge which are most important. The northern limit for the growing of the southern muscadine varieties coincides fairly closely with

the line marking the upper boundary of the section with a 200-day frostless period, and the zone extending from the Gulf of Mexico to this northern boundary also has been found best suited to the growing of those standard varieties that have been developed in the deep South. (See fig. 2, pp. 18 and 19.)

Because of its influence on the development of the fungus diseases that attack the grape, the relative humidity of the air is perhaps the next most important single factor in varietal adaptation. The vinifera, or European varieties, which are very susceptible to fungus diseases, are favored in the hot, dry central valleys of California and the hot irrigated sections of Arizona and Texas, where these diseases cannot thrive, whereas the same varieties in the humid regions of the South and East are quickly destroyed unless given special care. On the other hand, some varieties, including the muscadines, appear to thrive best in regions where the humidity is relatively high. The presence of fungus diseases and the degree of susceptibility of American varieties to them often determine what varieties may be grown successfully in various regions.

In some parts of the country the temperature level, the length of the growing season, and the character of the soil [3] may be satisfactory for the successful growing of grapes, and yet many varieties fail for lack of adequate soil moisture. Varieties differ considerably in the character of their root systems and in their ability to penetrate deeply into the soil. Where the rainfall is light and water for irrigation is not available, only those varieties that are able to send their roots deep into the ground will prove adapted to the region. This is particularly true in the semiarid and arid sections of the Southwest.

In some regions the presence of root parasites in the soil determines that only those varieties having natural resistance to them can be grown. In those States where the vinifera grapes are cultivated it is necessary to use phylloxera-resistant rootstocks to grow these grapes successfully, and in many districts the production of grapes is feasible only when either nematode-resistant stocks or varieties are used. The root knot nematode is injurious, especially in sandy soils, while phylloxera is usually more destructive on the heavier soil types. At present the use of resistant rootstocks is the only practicable method of combating these two grape pests. In certain parts of the South where the cotton root rot is prevalent, it is not feasible to grow most standard varieties except on resistant rootstocks, because their root system are also attacked by the root rot organism. According to Circular No. 89 of the Texas Agricultural Experiment Station, the varieties Dog Ridge, Champanel, and La Pryor, while not entirely immune to the root rot organism, are promising rootstocks for use in infested areas.

As more is learned about the influence of these and other limiting factors on grape production, it becomes increasingly clear that there is no one best grape, nor is there ever likely to be one, that will be adapted to all parts of the country. Rather, use must be made of

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[3] Although grapes grow and do well on a wide variety of soils and show greater adaptation to various soil conditions than many other fruits do, they prefer medium sandy or gravelly loams of good fertility with good drainage. Of the two factors soil type and suitable drainage, the latter is doubtless of greater importance.

such varieties as have been found adapted to the environmental conditions in different regions, and endeavors must be made to develop through breeding and selection superior sorts to meet specific needs.

GRAPE REGIONS AND ADAPTED VARIETIES

Taking into consideration the length of the growing season, the rainfall range, the average seasonal temperature, the minimum winter temperature, and other factors affecting the performance of vines, together with the observations and experience of many scientific workers dealing with grapes, an attempt has been made to determine the boundaries of regions where specific varietal groups are most likely to thrive. A map of the United States on which these regions have been outlined as precisely as practicable is included in this bulletin. (See fig. 2, pp. 18 and 19.) Obviously, such a map can be only approximately accurate because restricted areas within any region may have either less or more favorable conditions for grape production than prevail for the region as a whole, and on a map of this size it is not feasible to deal with all of them. Furthermore, the inclusion of a particular area within any region does not mean that the recommended varieties will certainly thrive there. The character of the soil, the availability of necessary nutrient substances, possible excesses of harmful soil constituents, natural drainage, direction of exposure to sun and prevailing winds, and other factors must all be taken into consideration. Therefore, those persons directly interested in the production of grapes in a specific locality should seek the advice of the local county agent.

In table 1 is given a brief summary of the salient characteristics of the different regions outlined. A more detailed discussion of the regions and of the grape varieties adapted to them is presented under the separate region headings. The most important varieties mentioned are described on pages 21 to 38.

REGION 1

Region 1 includes all of Maine and New Hampshire, except the coastal fringe, all of Vermont, parts of Massachusetts, northern New York, except the part bordering Lake Ontario, the southern mountainous districts of New York and the Allegheny Mountain sections of Pennsylvania and West Virginia, part of eastern Ohio, the northern two-thirds of the Lower Peninsula of Michigan and all of the Upper Peninsula, northern and central Wisconsin, most of Minnesota, parts of northern Iowa, the eastern part of North Dakota, most of eastern South Dakota, and part of central Nebraska.

This region is characterized by a growing season of 90 to 150 days and low winter temperatures. The annual rainfall for most of the region ranges from 25 to 45 inches. In restricted eastern parts it averages as much as 50 inches, and in the extreme western part it amounts to only 20 inches. Soil conditions are variable. The short growing season and severe winter temperatures determine that only early-maturing and the most hardy varieties can be grown without winter protection, except in sheltered valleys or especially favored locations. Owing to the rela-

TABLE 1.—*Summary of regional characteristics*

Region No.[1]	Growing days	Lowest mean January temperature	Annual rainfall		Humidity	Remarks
			Average range	Extreme range		
	Number	*° F.*	*Inches*	*Inches*		
1	90 to 150	− 10 to 15	25 to 45	20 to 50	High	Only hardy or early ripening varieties adapted. Winter protection may be advantageous.
2	150 to 180	15 to 30	30 to 40	20 to 50	do	Standard northern varieties adapted.
3	180 to 200	20 to 35	35 to 50	20 to 55	do	Transition zone; not entirely favorable for either the northern or southern varieties.
4	200 to more than 240	30 to 50	45 to 60	20 to more than 60.	do	High summer temperatures and high humidities prevail. Standard southern and muscadine varieties adapted.
5	Less than 90	−10 to 15	10 to 40		Variable	Mountainous region. In general, not suitable for grapes. Special hardy varieties may possibly be grown in selected locations.
6	90 to 150	−10 to 25	5 to 20		Low	Irrigation required. Only hardy or early maturing varieties adapted.
7	150 to 200 in northern to 240 in southern.	20 to 45	5 to 20		do	Irrigation necessary or desirable. Standard northern varieties adapted to northern parts; standard southern and selected northern varieties adapted to southern parts. Early maturing vinifera varieties in selected locations, with winter protection advisable.
8	150 to 240	25 to 40	15 to 20 in southern part to 60 to 100 in northern part.		Low in southern part to high in northern part.	Selected northern grape varieties adapted. Early vinifera varieties in special locations may be grown, with winter protection advisable in the more severe seasons.
9	200 to over 300	40 to 50	5 to 20 in southern part to extreme of 50 in northern part.		Low	Very high summer temperatures. Mainly a vinifera region, but some eastern varieties may be grown in the cooler locations.

[1] See figure 2 (pp. 18 and 19) for outlines of regions.

tively high atmospheric humidity over most of this area during the growing season, the use of sprays for the control of fungus diseases [4] is required for best results.

The varieties suggested for this region are Beta, Clinton, and Bacchus. In the more favored locations the early-maturing varieties Portland, Fredonia, and Worden are suggested for trial, and under special conditions the later varieties Concord and Niagara may prove worth while for farm-home planting. Winter protection for the last five is suggested as an added safeguard against loss, and in the extreme western semiarid locations irrigation may be found advantageous.

REGION 2

Region 2 may be considered as the most favorable for the production of the northern standard varieties. It is extensive, and its boundaries are extremely irregular, owing primarily to the influence of differences in elevation and of large bodies of water on seasonal temperatures and the length of the growing season. It includes a narrow coastal strip of Maine, New Hampshire, and Massachusetts except the Cape Cod peninsula, southern and central Massachusetts, all of Rhode Island and nearly all of Connecticut, the Hudson and Mohawk River Valleys and the central Finger Lakes and lake-shore districts of New York, most of New Jersey excepting the southwestern district bordering Delaware Bay, and most of the southern Susquehanna River Valley and lake-shore districts of Pennsylvania. Most of northern and western Maryland and of West Virginia, exclusive of that part coming within region 1, is included in region 2, as well as much of eastern Kentucky and the eastern and southern slopes of the mountains of North Carolina, South Carolina, and Georgia. Small districts of eastern Tennessee are also included. From Ohio westward the northern limits of this region are formed partly by Lakes Erie, Huron, and Michigan and by the southern boundaries of region 1 in Michigan, Wisconsin, Minnesota, Iowa, South Dakota, and Nebraska to the 20-inch rainfall line. In Ohio, Indiana, and Illinois the southern boundary of the region is delimited by the warmer valley sections of the Ohio, White, Wabash, and Mississippi Rivers. The northern and part of the Ozark districts of Missouri and that part of Kansas extending from near the northeastern corner of the State southwestward to the 20-inch rainfall line are also included.

The most important single characteristic of this region is the length of the period free from killing frosts, which varies from 150 to 180 days. Within most of this area the average rainfall ranges from 30 to 40 inches, but in central and southern Missouri it is somewhat higher and in some of the smaller eastern districts amounts to 50 inches. From eastern Nebraska and Kansas westward it gradually falls off to 20 inches. The atmospheric humidity during the growing season over most of the area is relatively high; this favors the development of fungus diseases. For satisfactory results spraying must be practiced for the control of these as well as of insect pests. The soils vary widely in character.

On the basis of the experience of growers in this region as a whole, the varieties that have been found best adapted for commercial plant-

[4] For more complete information on grape diseases, consult Farmers' Bulletin 1893, Control of Grape Diseases and Insects in Eastern United States.

ing are Concord, Delaware, and Niagara. In addition to these, desirable varieties adapted to small-scale and farm-home growing are Agawam, Brighton, Ontario, and Worden. Other varieties that have found favor with some growers are Brocton, Caco, Catawba, Diamond, Diana, Dunkirk, Elvira, Golden Muscat, Ives, Keuka, Lucile, Martha, Moore Early, Noah, Urbana, Vergennes, and Winchell. Fredonia, Portland, Seneca, Sheridan, Van Buren, and Westfield are suggested for trial.

Special mention is made of the fact that in the Ozark section of this region certain varieties that have performed less favorably in other sections have been found to do well. Among these are Rogers hybrids, Agawam, Barry, Gaertner, Herbert, Lindley, and Merrimac.

REGION 3

Region 3, which is an eastern and southern extension of region 2, includes the Cape Cod district of Massachusetts, Long Island, the coastal district of New Jersey, all of Delaware, most of eastern and central Maryland, the central sections of Virginia and North Carolina, the Piedmont sections of South Carolina, Georgia, and Alabama, most of Tennessee, much of Kentucky, the southern sections of Ohio, Indiana, and Illinois, considerable sections of Missouri and northern Arkansas, the southeastern part of Kansas, and parts of northern Oklahoma and the Texas Panhandle. The boundaries of this region are very irregular and may be determined by reference to the map.

Land elevation, latitude, location, and direction of the river valleys, and, in the case of the extreme eastern part, the Atlantic Ocean, which influence the temperature, humidity, and possibly other factors concerned in grape performance, determine the extent and climatic character of this region. The frost-free period varies from 180 to 200 days. The rainfall over most of the area amounts to 35 to 50 inches. In the western part it gradually falls off to 20 inches, and in the south and southeastern parts it amounts to 55 inches or more. The soils also vary widely in character. Fungus diseases and insect pests are prevalent.

From the standpoint of grape performance this region represents a transition zone within which the standard northern varieties do not thrive very well and commonly fail to mature their fruit satisfactorily, while standard varieties of the bunch-grape type developed through hybridization with native southern species, particularly in the more northern sections of the region, likewise fail to give high yields or to develop satisfactory quality. Within this region more uniform ripening of the northern varieties has been obtained by providing a higher ratio of foliage to fruit by means of more severe pruning, heavier fertilizing, or reducing the number of flower clusters at or just before blossoming time.

Consideration of the observations made by persons familiar with local conditions shows no uniformity of opinion as to the varieties best adapted to it. This is owing in part, no doubt, to the fact that the same varieties have not been fully tested in all localities and in part to considerable differences in local environmental conditions. Even though the length of the growing season is the same, a range of 8° of latitude is bound to bring into play seasonal factors that cause differences in varietal performance. Delaware, Niagara, Con-

cord, and Catawba are the varieties that are being most widely recommended, but not in all States. In the eastern part of the region Fredonia, Ontario, Portland, and Worden are also receiving favorable mention, while in the southeastern and southern parts Armalaga, Bailey, Brilliant, Brocton, Caco, Edna, Extra, Lutie, and Sheridan are added to the first four varieties mentioned. In the Ozark section the more productive varieties that have been reported are Agawam, America, Brighton, Brilliant, Catawba, Cloeta, Concord, Cynthiana, Delaware, Diamond, Dr. Collier, Ellen Scott, Elvira, Extra, Fredonia, Herbert, Ives, Lindley, Lomanto, Lucile, Muench, Niagara, Portland, Rommel, and Vergennes. In the extreme western part of the region America, Armalaga, Bailey, Beacon, Catawba, Champanel, Cloeta, Delaware, Edna, Ellen Scott, Extra, Goethe, Last Rose, Lenoir, Manito, Rommel, and Wapanuka are being recommended.

REGION 4

Region 4 includes the Chesapeake Bay and parts of the Coastal Plain sections of Maryland and Virginia, eastern North Carolina, most of South Carolina, all but the northern sections of Georgia and Alabama, all of Florida, most of Mississippi, the western sections of Tennessee and Kentucky, the southern tip of Illinois and southeastern Missouri, all of Arkansas south of the Ozark Plateau, all of Louisiana, most of eastern and central Oklahoma, and Texas westward to the 20-inch rainfall line.

The frost-free period for most of this region varies from 200 to 240 days, with limited areas having a somewhat longer growing season. The rainfall for the eastern and central parts amounts to 45 to 60 inches, but from eastern Oklahoma and eastern Texas westward it gradually decreases to 20 inches. Hot summer temperatures and high humidity prevail over all but the westernmost parts. The southern part of the Florida peninsula, the Mississippi River Delta, and a narrow strip of the east coast of Texas where killing frosts do not occur every year are not suited to the growing of standard grape varieties. The broken lines on the map (see fig. 2, pp. 18 and 19) indicate the upper boundaries of these districts.

Root rots and other fungus diseases, insect pests, nematode parasites, and other destructive agents are perennial threats to successful bunch-grape production. A partial solution of the bunch-grape growers' problems has been found in the development of varieties through hybridization of native wild species with more desirable sorts, though in general the quality of the grapes thus derived leaves considerable to be desired. Breeding investigations now under way look toward the development of improved varieties for this region. The use of disease- and nematode-resistant rootstocks has yielded beneficial results and seems the most promising immediate means of dealing with graperoot problems, while carefully worked-out and consistently adhered-to spraying schedules successfully control aboveground enemies.

Muscadine grapes are native to the eastern part of this region and may be cultivated over most of its areas. Though not immune to fungus diseases, they are markedly resistant to them as well as to some of the other agents destructive to the bunch grapes. They are, therefore, particularly valuable for growing in this region. Mention is

made again of the fact that among most of the muscadine grapes now grown the fruit-bearing vines are not self-fruitful, and it is necessary to plant male vines in the vineyard to serve as pollinizers, in order to obtain a satisfactory crop.

The bunch-grape varieties that have done best on their own roots are those that have been derived through breeding with native southern species, though these are not fully immune to grape ailments. Of these Beacon, Carman, Champanel, Extra, Marguerite, Muench, R. W. Munson, and Salamander appear most reliable in this region. America, Armalaga, Bailey, Cloeta, Edna, Ellen Scott, Fern Munson, Last Rose, Lomanto, Manito, Rommel, and Wapanuka have each found favor with some growers. Herbemont and Lenoir, representatives of *Vitis bourquiniana* which are valuable more particularly for juice and wine making, are grown somewhat, though the fruit is especially susceptible to black rot. In some areas Caco and Lutie have done fairly well.

Some of the standard northern varieties on suitable rootstocks have done reasonably well when given suitable vineyard care. Of these, Niagara, Portland, Fredonia, Delaware, and Catawba have given most favorable results.

For use as rootstocks, the varieties Dog Ridge, R. W. Munson, Champanel, Cynthiana, La Pryor, and unnamed selections of *Vitis champini* have given most favorable results, though none of them have been found entirely immune to root rot.

In the muscadine grape group, Scuppernong, Thomas, and Hunt lead in favor. Among the other varieties possessing desirable properties are Creek, Creswell, Dulcet, Eden, James, Memory, Mish, Scott (Black Beauty), and Yuga.

REGION 5

Region 5, which is extremely irregular in outline and of great extent, is made up of the mountainous sections of the Pacific Coast and other Western States, where high elevation and low average temperatures make for a frost-free period of less than 90 days. This area can scarcely be considered a grape-growing region at all, but within it may possibly be found small sheltered valleys and sunny slopes where, with winter protection, some especially hardy varieties may be grown. In such locations Beta, Clinton, and Bacchus are suggested for trial.

REGION 6

Region 6 surrounds region 5 and includes a broad expanse of territory extending from the 20-inch rainfall line in the Dakotas and Nebraska southwestward into New Mexico and Arizona and westward to the Pacific slope. It is really a westward extension of region 1 but has a lower annual rainfall. Part of the area, particularly the intermountain part, is desert. Low winter temperatures, a frost-free period of 90 to 150 days, low atmospheric humidity, and restricted water supply characterize the region. The soils cover a wide range in types. Over much of the area they are alkaline in character, in some sections highly so. Grapes may be grown within the river valleys and in the vicinity of mountains where temperature conditions are not too severe and water is available for irrigation. The low

atmospheric humidity prevents the extensive development of fungus diseases, and low winter temperatures are unfavorable to insect pests. Spraying therefore is generally unnecessary.

The varieties most likely to succeed in this region are those that are fully winter hardy and early in maturing. Where growing conditions are favorable, the varieties Beta, Clinton, and Bacchus should be found adapted. In the more favored locations the early-maturing varieties Portland, Fredonia, and Worden are suggested for trial. Winter protection is recommended for these last three.

REGION 7

The area designated as region 7 is not a continuous unit. It has as its eastern boundary the 20-inch rainfall line and includes the southwestern corner of Nebraska and sections of western Kansas and Oklahoma and of western Texas south to a narrow belt bordering the Rio Grande; it also includes much of eastern Colorado and an isolated locality in the general region of Denver, as well as a large part of New Mexico, sections of central Arizona, southern Nevada, and southeastern California, and belts bordering the Colorado River and its tributaries in Arizona, New Mexico, Utah, and Colorado. A narrow zone about Great Salt Lake, a small locality in southwestern Idaho, and a zone about the Columbia and Snake Rivers and their tributaries, extending from the Cascade Mountains eastward in northern Oregon, southern and central Washington, and northwestern Idaho also belong in this region.

Although parts of this region are widely separated, they have much in common. The more northern units, in Washington, Oregon, Idaho, Utah, and Colorado, have a frost-free period of 150 to 200 days, while in parts of the more southern areas this period extends to 240 days. All have limited rainfall and are dependent on either irrigation or dry-land farming practices to produce a crop. Over parts of the region the soils need only water to make them productive, but considerable areas are found where excesses of harmful soil constituents, such as alkalies and various salts, are found. In some of the river valleys where irrigation can be practiced, conditions are particularly favorable for grape culture, and in certain sections grapes succeed better than any other fruit crop. Low atmospheric humidities prevail, and fungus diseases and insect pests give the grape grower a minimum of concern.

In consideration of varietal adaptation to the different parts of this region some distinctions have to be made. Where irrigation is practiced wider varietal adaptation is noted than where strictly dry-farming practices are necessary. Thus in the irrigated sections falling within Washington, Oregon, Idaho, Utah, and Colorado many of the standard northern varieties have been found well adapted, whereas in the southern Great Plains section of southeastern Colorado, southwestern Kansas, western Oklahoma and Texas, and eastern New Mexico, where water is not generally available for irrigation purposes, only those varieties that are able to send their roots deep into the soil for water can be grown successfully. Relatively few of the northern varieties appear able to do this. In part because of this and in part apparently because of the imperfectly understood influence of latitude on varietal performance, mentioned earlier in the discussion

of the eastern regions, the varieties that usually succeed best in this region are those that were developed in the Southwest. Not all of these do equally well in different sections of this region because of variation in local environments.

The varieties that have been recommended for the northern irrigated sections of region 7 are Agawam, Barry, Brighton, Brilliant, Campbell Early, Concord, Delaware, Diamond, Dunkirk, Ives, Lindley, Niagara, Ontario, Portland, Vergennes, and Worden. Fredonia, Golden Muscat, Seneca, Sheridan, Urbana, Van Buren, and Westfield are suggested for trial.

For the southern Great Plains section Armalaga, Caco, Carman, Catawba, Edna, Ellen Scott, Extra, Goethe, Lenoir, and Manito have been recommended. Additional varieties that have been found adapted to some parts of this area are Bailey, Beacon, Cloeta, Delaware, Fern Munson, Lomanto, Muench, R. W. Munson, and Salamander.

In isolated localities of this region, namely, in western Colorado, southwestern Utah, southeastern Washington, western and southern Idaho, north-central Oregon, and north-central New Mexico, some vinifera grapes are grown. Owing to the somewhat shorter growing season, the earlier ripening varieties have proved more desirable. In general, winter protection is advisable, especially in the more severe seasons. The varieties that have been grown vary in the different localities. The more important varieties grown there are Alicante Bouschet, Black Hamburg, Cinsaut (Black Malvoisie), Malaga, Mission, Muscat Hamburg, Muscat of Alexandria, Olivette Noire (Cornichon), Prune de Cazouls, Sultanina (Thompson Seedless), and Zinfandel. Special early types that may be worthy of trial include Alicante Ganzin, Alphonse Lavallee (Ribier), Blauer Portugieser, Castiza (Red Malaga; Molinera), Chasselas Doré (Gutedel; Golden Chasselas), Muscadelle du Bordelais, and Sylvaner (Franken Riesling).

REGION 8

Region 8 extends from Canada to the southern border of California, including the western coastal section of Washington and Oregon, the northwestern coastal district of California, and the foothills of central California, together with the higher elevations of the Coast Range. The growing reason ranges from 150 to 240 days. The annual average rainfall ranges from 15 to 20 inches in the southern part of the region and from 60 to 100 inches in the more northern parts. Variable types of soil are represented. In the California district are found rolling foothills and higher elevations where vinifera varieties are not normally grown, although isolated plantings may occur. In some locations where normal rainfall is adequate or irrigation water is available, native American types are grown for local or home use. The varieties are mainly Concord, Isabella, and Pierce.

The Willamette Valley and some of the southwestern part of Oregon are in this region. A wide assortment of American varieties may be grown in both places; however, the most important varieties are Concord, Campbell Early, Worden, Niagara, Diamond, Golden Muscat, and Agawam. In the southwestern part, some vinifera varieties do well in the more favorable locations. Flame Tokay and

Muscat Hamburg are the most important varieties. Winter protection is desirable and sometimes necessary.

The western district of Washington included in this region is more adapted to the growing of American native varieties. The black varieties grown include Concord, Campbell Early (known also in this region as Island Bell), and Worden; the principal white varieties are Niagara and Diamond; and the red varieties are Agawam and Delaware. Some vinifera varieties, especially the early-ripening ones, may be grown in the more favorable locations. Winter protection has been necessary for the safe culture of vinifera varieties. The vinifera varieties that are reported growing in this southeastern part of Washington are Alicante Bouschet, Carignane, Cinsaut (Black Malvoisie), Muscat of Alexandria, Perle de Csaba, and Zinfandel.

REGION 9

Region 9, which includes the hot interior valleys and warm coastal districts of California, the southwestern part of Arizona, a small district at the southern border of New Mexico, and the lower Rio Grande district of Texas, may be designated as the true vinifera-growing areas in the United States. The length of the growing season ranges from 200 to over 300 days between killing frosts. The mean summer temperature, June to September, ranges from 70° to 90° F. or above, and appears more favorable for vinifera table, raisin, and sweet-wine varieties. The average annual rainfall is variable, ranging from 5 to 20 inches in the southern part of the region to an extreme of 50 inches in the more northern parts.

Where the average annual precipitation falls below 20 to 25 inches, additional water is supplied by surface irrigation. The almost complete absence of rain during the period from June to September, high temperatures, low humidity, and an abundance of sunshine combine to make this region especially favorable for the growing of vinifera grapes. Owing to low humidity, fungus diseases are not serious. Sulfur dusting is practiced to control powdery mildew (*Uncinula necator* (Schw.) Burr.). The grape leafhopper (*Erythroneura comes* (Say)) is the main above-ground insect in the warmer areas and is controlled by various spraying and dusting programs. Where grape phylloxera (*Phylloxera vitifoliae* (Fitch)) and root knot nematode (*Heterodera marioni* (Cornu) Goodey) infest the soil, varieties may be grafted on resistant rootstocks.

With the exception of a number of smaller plantings in Arizona, New Mexico, and the district shown in Texas, the grape production of this region is located mainly in California. Although the map indicates this region as reaching the Pacific coast, the main producing centers are the interior and coastal valleys. A strip of land immediately adjacent to the Pacific Ocean is not favorable for grape production. This is mainly because the moderating effect of the ocean in the southern part prevents the temperature in winter from falling sufficiently low for the vines to become dormant and because in the northern part adjacent to the ocean the summers are too cool to ripen the fruit properly.

In the southern part of this region and in the southern district of California, grapes are grown for early table shipments and wine manufacture and in small localities for raisin production. While

most of the varieties grown belong to the vinifera species, some commercial production of the American varieties Concord, Pierce, and Isabella is included. The principal table varieties of this southern part include Alphonse Lavallee (Ribier), Emperor, Malaga, Muscat of Alexandria, and Sultanina (Thompson Seedless). The more important wine varieties are Alicante Bouschet, Burger, Carignane, Feher Szagos, Grenache, Grignolino, Mission, Palomino, and Zinfandel.

In the central part of this region, including the San Joaquin and lower Sacramento Valleys, are grown vinifera grape varieties, which produce most of the raisin, table, shipping, and storing fruit and the bulk of grapes for sweet-wine manufacture. The raisin varieties include Sultanina (Thompson Seedless), Muscat of Alexandria, Sultana, and Corinthe Noir (Zante Currant). The main table varieties include Sultanina (Thompson Seedless), Malaga, Emperor, Castiza (Molinera; Red Malaga), Olivette Noire (Cornichon), Ohanez (Almeria), Alphonse Lavallee (Ribier), and minor shipments of other varieties. The wine varieties include Zinfandel, Alicante Bouschet, Carignane, Grenache, Mission, Muscat of Alexandria, Palomino, Feher Szagos, Burger, Cinsaut (Black Malvoisie), Petite Syrah (Duriff; Serine), and minor plantings of the coloring varieties Lenoir and Salvador.

In the cooler valleys and coastal areas of the northern part of this region grapes are grown mainly for the manufacture of dry wines. Many varieties are grown in the various locations and for the various types of wine produced. Some of the more important black varieties that are grown include Zinfandel, Petite Syrah (Duriff; Serine), Carignane, Mataro, Alicante Bouschet, Refosco (Crabb Black Burgundy), Cabernet Sauvignon, and Grand Noir. Other varieties grown in lesser quantities are Barbera, Sangioveto, Tannat, and Valdepenas. The more important white varieties include Palomino, Semillon, Burger, Sylvaner (Franken Riesling), Colombar (erroneously called Sauvignon Vert), and Green Hungarian. Other white varieties grown in lesser quantities include Sauvignon Blanc, Traminer, Muscat de Frontignan (Muscateller), Muscadelle du Bordelais, Pinot Blanc, Pinot Noir (Black Pinot), and Johannisberger.

VINIFERA GRAPE GROWING IN EASTERN UNITED STATES

Since colonial times there has been recurrent interest in the growing of vinifera grapes in the Eastern States, but of the numerous attempts that have been made to establish commercial plantings few if any have succeeded. Vinifera grapes are being grown to a limited extent in some eastern localities, but under distinct handicaps, and the project has been successful only where enthusiastic interest on the part of the grower has made him willing to give diligent attention to their care. The handicaps are several. In the first place, as previously mentioned, vinifera grapes require a long growing season and relatively high temperatures in order to mature the fruit, and they do not tolerate low winter temperatures well. These facts fairly effectively prevent their thriving in the northern areas of the East. Winter protection of the vines in more southern, especially favorable, locations has been found of some value. In the central,

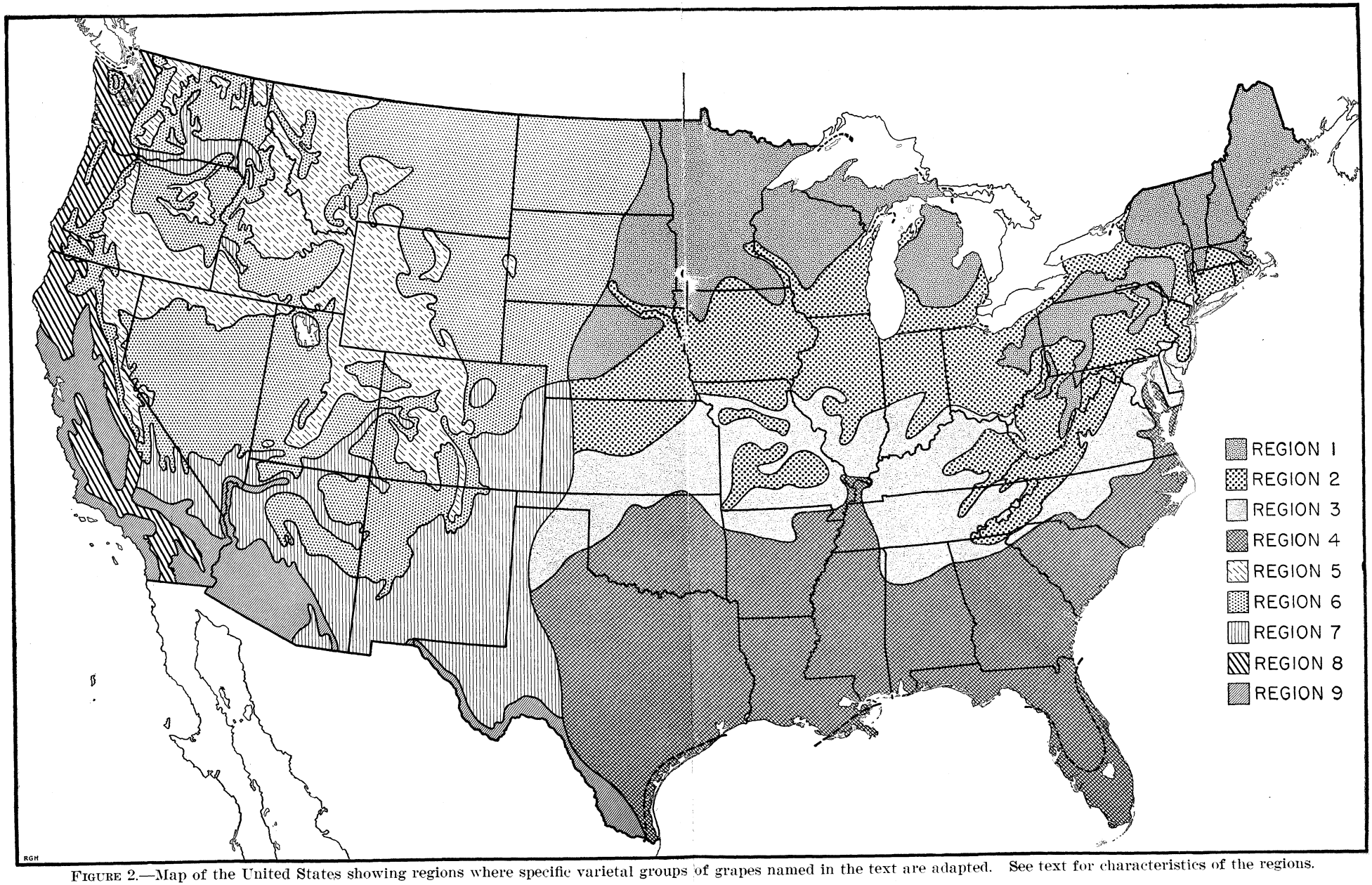

FIGURE 2.—Map of the United States showing regions where specific varietal groups of grapes named in the text are adapted. See text for characteristics of the regions.

eastern, and southern areas where temperature conditions are favorable, high humidities, which favor the development of fungus diseases and other foliage and fruit pests, prevail, and the vines must be sprayed repeatedly and often to keep them under control. In addition, these grapes are highly susceptible to injury from phylloxera, root knot nematode, and various root rots, so that to succeed they must be grafted on resistant rootstocks. Persons willing to take these handicaps into consideration and to give the vines the necessary attention may satisfy their desires in a limited way, but large-scale growing of this type of grape in the East cannot be recommended.

The varieties of vinifera grapes considered likely to prove the least disappointing under eastern conditions are Alicante Bouschet, Black Hamburg, Cinsaut (Black Malvoisie), Malaga, Mission, Muscat Hamburg, Muscat of Alexandria, Olivette Noire (Cornichon), Prune de Cazouls, Sultanina (Thompson Seedless), Zinfandel, Alphonse Lavallee (Ribier), Blauer Portugieser, Castiza (Red Malaga; Molinera), Chasselas Doré (Gutedel; Golden Chasselas), and Sylvaner (Franken Riesling).

WINTER PROTECTION OF GRAPES

In some of the colder regions winter protection of grapes may be necessary. Various reports and observations indicate that vinifera varieties are not so resistant to low temperatures as the more common native varieties, but even native types that have vinifera characters predominating or have originated from the southern species frequently suffer cold or winter injury in the more severe winters. Vinifera varieties may stand temperatures as low as 0° F., or even several degrees below 0°, if the wood is well matured. Usually injury will occur at somewhat higher temperatures than this, since, where lower temperatures occur, the season is not sufficiently long to mature the wood properly. American varieties will vary in cold resistance according to the various species entering into their make-up, and also according to the degree of maturity of the wood at the time the low temperatures occur.

Relatively little experimental work has been done in the United States on the winter protection of grapes. Anthony [5] reported that satisfactory protection for certain vinifera varieties was obtained by pruning the vines before the soil froze, bending them down and covering them with a few inches of soil. Experiments conducted at the New Mexico Agricultural Experiment Station [6] showed that mounding of the soil about the vines gave effective protection from winter injury. Laying the vines on the ground and covering their trunks and canes with earth has been practiced in other States, and the use of evergreen boughs instead of soil has also been found effective in some cases.

In some areas, as, for example, in the northern Great Plains, the harmful effect of drying winter winds is as great as that of low temperatures. In such cases adequate winter protection may sometimes be obtained by providing suitable windbreaks. Shocks of corn placed to the windward of vines are sometimes used for this purpose.

[5] ANTHONY, R. D. VINIFERA GRAPES IN NEW YORK. N. Y. State Agr. Expt. Sta. Bul. 432, pp. [80]–105, illus. 1917.

[6] GARCIA, F., and RIGNEY, J. W. WINTER PROTECTION OF THE VINIFERA GRAPE. N. Mex. Agr. Expt. Sta. Bul. 100. 32 pp., illus. 1916.

Where winter protection is necessary, cultural practices that aid in the early maturing of the wood are beneficial. Cultivation should cease early in the season, and the growing of a cover crop may help mature the canes.

Whatever type of winter protection is to be used, the pruning and training of the vines should be such as to facilitate protection. If the vines are headed low and the canes are attached to a suitable trellis during the growing season, they can be released in the fall, laid along the vineyard row, and the soil thrown over the heads of the vines and the canes by a plow. If more mounding is required, this can be done with a shovel. With the vinifera grapes, the vines are often headed low and spur pruning is practiced; the canes are tied together upright, and the soil is mounded over the trunk and all but the tips of the canes. About the farmstead where American varieties that require long-cane rather than spur pruning are used, the vine is often trained on a slanting trellis or arbor supported by movable posts. In the fall these may be removed and the vine lowered to the ground for covering. Local conditions will determine the most appropriate methods to use.

The time for covering the vines for winter protection will vary in different localities and in different years. The covering should be applied after the leaves drop but before the ground freezes. The depth of covering will vary with the severity of cold anticipated. Two to six inches of soil has given satisfactory results in some locations. Pruning may be done prior to covering or early the following spring.

Protected vines should be uncovered in the spring before the buds start growth, in order to avoid injury to the new shoots, but uncovering should be delayed as long as possible.

DESCRIPTION OF AMERICAN VARIETIES

BUNCH GRAPES

In this section are given the species make-up,[7] the origin, and a brief general characterization of the principal American bunch-grape varieties mentioned in the preceding discussion. Typical clusters of some varieties are shown in figure 3.

White varieties

ARMALAGA.—(Lin., Lab., Vin.) Origin, Texas, 1902. Vine vigorous, healthy, hardy at temperatures above 0° F., moderately productive. Flowers self-fertile. Clusters large, shouldered, compact. Berries large, amber-colored, ovoid. Skin thin but tough. Pulp melting, juicy, sprightly, and of good flavor. Midseason. A table and market grape. Where rootstocks are necessary, Champanel and La Pryor have been found satisfactory. Suggested for the western part of region 3, parts of region 4, and the southern part of region 7.

BROCTON.—(Lab., Vin., ?Aes.) Origin, New York, 1919. Vine of medium vigor, hardy in regions suggested, productive. Flowers self-fertile. Clusters medium in size, cylindrical, sometimes shouldered, medium compact. Berries green to amber-colored, medium in size, variable ovoid in shape. Skin thin and rather tender. Pulp melting, juicy. Sweet, mild, and delicately flavored. Midseason. A home and local-market grape. Does not ship well. Suggested for regions 2 and 3.

[7] The abbreviations in parentheses following the name of a variety indicate the species entering into its make-up. Aes.=Aestivalis, Bou.=Bourquiniana, Cha.=Champini, Lab.=Labrusca, Lin.=Lincecumi, Rip.=Riparia, Rup.=Rupestris, and Vin.=Vinifera.

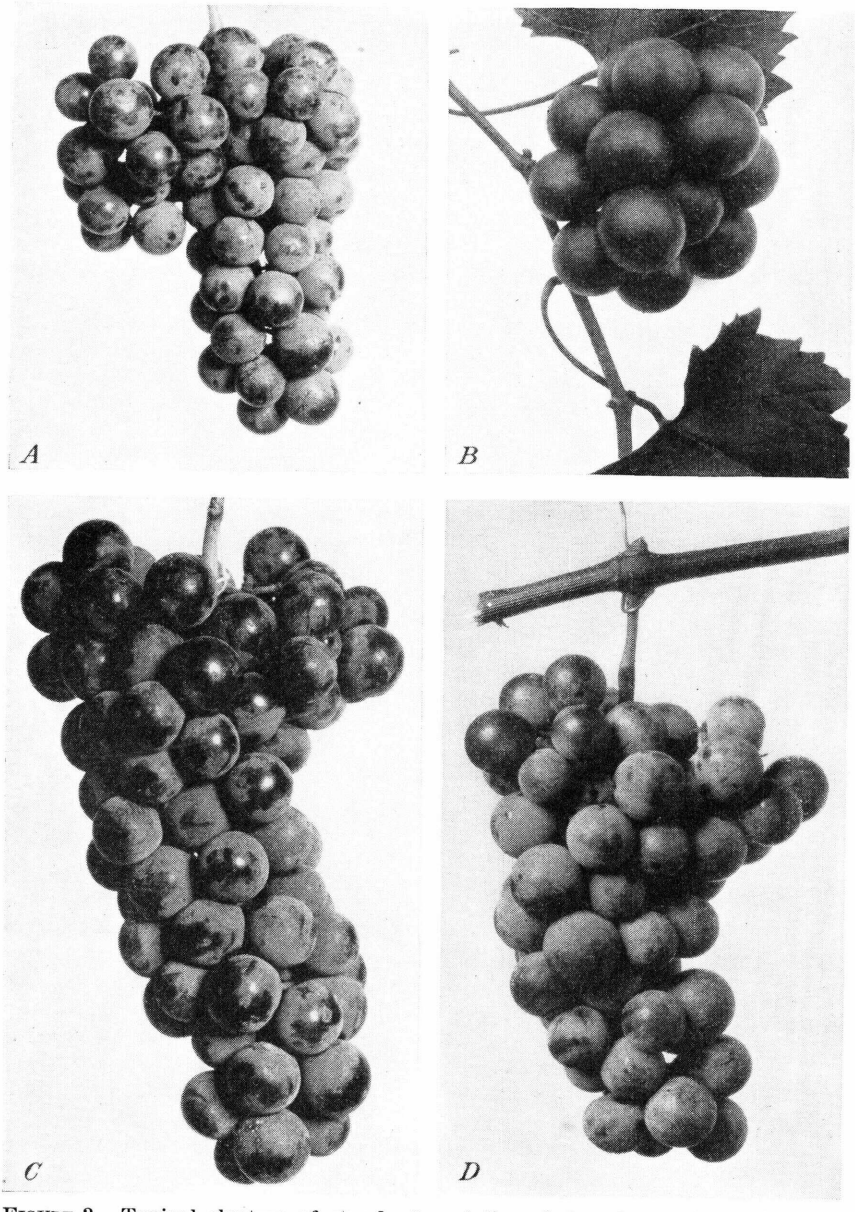

FIGURE 3.—Typical clusters of standard varieties of American table, juice, and wine grapes: *A*, Delaware, an excellent table grape, also used for wine making; *B*, Thomas, muscadine grape of fine quality used for table and juice purposes; *C*, Beacon, a table grape of southern origin; *D*, Concord, the most widely grown of American varieties, used for table and juice purposes. All half natural size.

DIAMOND.—(Probably Lab., Vin.) Origin, New York, about 1870. Vine of medium vigor, hardy and productive. Flowers self-fertile. Clusters medium in size, variable in shape, compact. Berries green, with yellowish tinge and thin gray bloom, medium in size, ovoid to spherical. Skin thin, medium tough, but sometimes it cracks, partially adherent to the pulp. Flesh tender and juicy, rather tart, delicately flavored. Midseason. A good all-purpose grape. Suggested for region 2, the Ozark section of region 3, and northern sections of regions 7 and 8.

EDNA.—(Lin., Lab., Vin.) Origin, Texas. Vine vigorous, healthy, hardy in districts suggested; medium in productiveness. Flowers imperfect and must be cross-pollinated. Armalaga and Ellen Scott are good pollinizers for this variety. Clusters large and compact. Berries white to light green, medium in size, ovoid to spherical. Skin medium thick and tough, but somewhat subject to cracking. Flesh tender, sweet but fairly tart. Attractive flavor. Midseason to late. A table and market grape. Where rootstocks are necessary Dog Ridge and La Pryor have been found satisfactory. Suggested for regions 3 and 4 and the southern section of region 7.

ELVIRA.—(Rip., Lab.) Origin, Missouri, 1863. Vine vigorous, healthy, hardy, and productive. Flowers self-fertile. Clusters medium in size, shouldered, compact. Berries green to yellow, with gray bloom, small to medium in size, spherical to ovoid. Skin thin and tender, adhering slightly to the pulp. Cracks badly. Flesh tender and juicy. Medium in sweetness; rather acid. Slightly foxy and rather flat in flavor. Midseason to late. Principal value is for wine making. Does not keep well. Suggested for regions 2 and 3.

GOLDEN MUSCAT.—(Vin., Lab.) Origin, New York, 1916. Vine vigorous, hardy, and productive. Flowers self-fertile. Clusters large, tapering, shouldered, and fairly compact. Berries green to amber-colored, with whitish bloom, fairly large, and ovoid. Skin thin but tough. Fresh tender and juicy, fairly sweet, with muscat flavor. A good table and market grape in the districts where adapted, but quality inferior in the more southern sections. Late. Suggested for region 2 and the northern section of region 7.

MARTHA.—(Lab., ?Vin.) Origin, Pennsylvania; introduced about 1868. Vine of medium vigor, hardy, medium in productiveness. Flowers self-fertile. Clusters medium in size, usually single-shouldered, rather loose. Berries green to amber, with thin gray bloom, medium in size, spherical. Skin thin and tender, adhering somewhat to the pulp. Flesh rather tough, sweet, and of rather low acidity. Slightly foxy in flavor. Midseason. Of value principally for wine. Does not keep or ship well. Suggested for region 2.

NIAGARA.—(Lab., ?Vin.) Origin, New York; fruited first 1872. Vine of good vigor, hardy at temperatures about 0° F., productive. Flowers self-fertile. Clusters medium to large, variable in shape, moderately compact. Berries amber-colored, with thin gray bloom, large, ovoid to spherical. Skin thin and tender, adhering slightly to the pulp. Flesh moderately tender only, juicy, sweet, with moderate acidity and strong foxy flavor. Midseason. A standard white dessert grape. For rootstocks, R. W. Munson and selections of *Vitis champini* have been found satisfactory. Suggested for region 2, the Ozark section of region 3, region 4 when grown on suitable rootstocks, and northern sections of regions 7 and 8.

NOAH.—(Rip., ?Lab.) Origin, Texas, about 1877. Vine vigorous, hardy in region suggested, productive. Flowers self-fertile. Clusters medium in size, tapering, medium compact. Berries light green with yellow tint, below medium to small, spherical. Skin medium tender, adhering somewhat to the pulp. Flesh juicy and rather tough. Sprightly; of vinous flavor and good quality. Late midseason. Primarily a wine grape. Suggested for region 2.

ONTARIO.—(Lab., Vin.) Origin, New York; introduced in 1908. Vine of moderate vigor, hardy, productive. Flowers self-fertile. Clusters medium to large and rather loose, usually single-shouldered. Berries green to amber, with thin gray bloom, medium in size, spherical. Skin fairly thin and medium tough. Flesh firm but fairly tender, juicy. Sugar content fairly high; acidity low. Flavor vinous, aromatic. Early. A very good early dessert grape. Suggested for regions 2 and 3 and the northern sections of regions 7 and 8.

PORTLAND.—(Lab.) Origin, New York, 1901. Vine vigorous, hardy, and productive. Flowers self-fertile. Clusters medium to large, cylindrical to somewhat tapering, often shouldered, rather loose. Berries green to amber, with thin gray bloom, large, spherical. Skin rather thick and fairly tough. Flesh firm but medium tender, juicy. Sugar content medium; acidity rather low. Somewhat foxy in flavor. Dessert quality good. Early to midseason. A fine dessert grape for home and market. R. W. Munson and selections of *Vitis champini* have been

found satisfactory rootstocks for this. Suggested for regions 2 and 3, and for region 4 when suitable rootstocks are used, and in favored sections in region 6 and the northern sections of regions 7 and 8.

ROMMEL.—(Lab., Rip., Vin.) Origin, Texas, 1883. Vine vigorous, hardy in the regions suggested, productive. Flowers self-fertile. Clusters medium in size, sometimes shouldered, medium compact. Berries green, medium to large, spherical. Skin thin and tender, with tendency to crack. Flesh tender, fairly sweet, and of medium acidity. Dessert quality fair. Midseason to late. A table grape for the home and local market. Too tender for shipping. Suggested for the Ozark and western sections of region 3 and the western section of region 4.

SENECA.—(Vin., Lab.) Origin, New York, 1917. Vine fairly vigorous, hardy, and productive. Flowers self-fertile. Clusters medium in size, tapering, fairly compact. Berries yellow, medium in size, ovoid. Skin thin and tender, adhering to the pulp. Flesh firm but tender. Sweet, with mild acidity and very fine aromatic, vinous flavor. Early to midseason. Berries adhere well to the vine. A fine dessert grape. Suggested for trial in region 2 and northern sections of regions 7 and 8.

WAPANUKA.—(Lab., Rip., Bou., Vin.) Origin, Texas, 1893. Vine vigorous, healthy, hardy in regions suggested, medium in productiveness. Flowers self-fertile. Clusters medium to large, shouldered, fairly compact. Berries amber in color, large, spherical. Skin thin, medium tough; tends to crack in humid sections. Flesh tender and juicy. Fairly sweet; acidity medium. Quality fair to good. Early midseason. A table and local-market grape. Too tender for shipping. Suggested for regions 3 and 4.

WINCHELL.—(Probably Lab., Vin., Aes.) Origin, Vermont, about 1850. Vine vigorous, hardy, and productive. Flowers self-fertile. Clusters medium or larger in size, tapering, usually shouldered. Berries green to amber, with thin white bloom, medium to small, spherical. Skin thin and tender. Flesh tender, juicy. Sugar content high; acidity medium to low. Dessert quality very good. Early. Berries rather too small for a satisfactory table grape. Useful for wine making. Suggested for region 2.

Red varieties

AGAWAM.—(Lab., Vin.) Origin, Massachusetts, 1852. Vine vigorous and healthy but lacking somewhat in hardiness in northern sections, fairly productive. Flowers self-fertile. Clusters medium to large, variable in shape, rather loose. Berries dark dull red, with lilac bloom, medium to large, spherical to ovoid. Skin thick and rather tough, adhering slightly to the pulp. Flesh tough. Sugar content and acidity medium. Flavor aromatic, slightly foxy. Midseason to late. A table and market grape, sometimes used in wine making. Suggested for region 2, the Ozark section of region 3, and northern sections of regions 7 and 8.

BRIGHTON.—(Lab., Vin., ?Aes.) Origin, New York; fruited first 1870. Vine medium to good in vigor, hardy, medium in productivity. Flowers largely self-sterile, requiring cross-pollination to assure a crop. Clusters large, usually long, tapering, broadly shouldered, medium loose. Berries dark red, with dark lilac bloom, fairly large, ovoid to spherical. Skin medium thick, tender, adhering somewhat to the pulp. Flesh fairly tender, sweet, medium in acidity. Flavor aromatic and vinous. Dessert quality high. Early to midseason. A desirable home grape. Suggested for region 2, the Ozark section of region 3, and northern sections of regions 7 and 8.

BRILLIANT.—(Lab., Vin., Bou.) Origin, Texas, 1883. Vine fairly vigorous, hardy in the regions suggested, and productive, with tendency to overbearing. Flowers self-fertile. Clusters medium to larger in size, usually shouldered, medium compact. Berries light to dark red, with lilac bloom, fairly large, ovoid to spherical. Skin thin but tough, adhering somewhat to the pulp. Flesh tender, juicy. Sweet; of medium acidity. Flavor vinous. Dessert quality good. Midseason. A home and market grape. Suggested for the Ozark section of region 3, and the northern sections of regions 7 and 8.

CACO.—(Lab., Vin.) Origin, New Jersey; date uncertain. Vine very vigorous, hardy, medium in productiveness. Flowers self-fertile. Clusters medium in size and compactness. Berries light red, fairly large, spherical. Skin thin, medium tough. Flesh fairly tender, juicy. Medium in sweetness and acidity; aromatic and vinous in flavor; dessert quality good. Midseason. A home and local-market grape. Suggested for regions 2, 3, and 7 and the northern section of region 8.

CATAWBA.—(Lab., Vin.) Origin uncertain; introduced in the District of Columbia about 1823. Vine vigorous, hardy, productive. Flowers self-fertile. Clusters fairly large, variable in shape, rather loose. Berries purplish red, with

lilac bloom, medium in size, ovoid to spherical. Skin thick and medium tough. Flesh rather tough. Sugar content fairly high; acidity medium. Flavor aromatic, vinous, slightly foxy. Late. A home and market grape, adapted to wine making. Dog Ridge, R. W. Munson, and selected stocks of *Vitis champini* are suggested as rootstocks where needed. Suggested for region 2, the Ozark and western sections of region 3, region 4 when grown on suitable rootstocks, and the southern Great Plains section of region 7.

DELAWARE.—(Probably Lab., Aes., Vin.) Origin uncertain; introduced in Ohio, 1849. Vine of medium vigor only, sometimes less; hardy, productive. Flowers self-fertile. Clusters medium to small, usually shouldered, very compact (fig. 3, *A*). Berries light red, with thin lilac bloom, small to medium. Skin thin and tough. Flesh tender, juicy. Sugar content high; acidity medium. Aromatic and vinous in flavor. Dessert quality very high. Midseason. A fine home and market grape, valuable for table use and for wine making. Dog Ridge, R. W. Munson, and selections of *Vitis champini* are suggested for rootstocks where needed. Suggested for regions 2 and 3, region 4 when a suitable rootstock is used, and northern sections of regions 7 and 8.

DIANA.—(Lab., Vin., ?Aes.) Origin, Massachusetts, about 1834. Vine vigorous, somewhat lacking in hardiness, medium to better in productiveness. Flowers self-fertile. Clusters medium in size, variable in shape, rather compact. Berries light red, with thin lilac bloom, medium to small, ovoid to spherical. Skin thick and tough, adhering slightly to the pulp. Flesh tough, juicy. Sugar content fairly high, acidity medium. Vinous in flavor, with little foxiness. Midseason to late. Keeps well. Primarily a wine grape. Suggested for region 2.

DUNKIRK.—(Lab., Vin., ?Aes.) Origin, New York, 1920. Vine vigorous, healthy, hardy, and productive. Flowers self-fertile. Clusters medium in size, cylindrical to tapering, compact. Berries red, medium in size, ovoid to spherical. Skin thin and medium tough. Flesh tender and juicy. Sugar content high; acidity medium. Mild aromatic flavor. Dessert quality good. Midseason. A home and market grape. Ships well. Suggested for region 2 and northern section of regions 7 and 8.

ELLEN SCOTT.—(Lin., Lab., Vin.) Origin, Texas, 1902. Vine vigorous, hardy in the regions suggested but susceptible to anthracnose in humid areas, productive. Flowers self-fertile. Clusters large, tapering, sometimes shouldered, medium compact. Berries reddish purple, with thin bloom, medium in size, spherical. Skin thin and tough. Flesh very tender, melting, juicy. Sugar content high; acidity medium. Sprightly and delicate in flavor. Late. A home, table, and juice grape. Suggested for the Ozark section of region 3, region 4, and the southern Great Plains section of region 7.

GAERTNER.—(Lab., Vin.) Origin, Massachusetts, 1852. Vine of medium vigor, usually hardy except in severe winters, productivity variable. Flowers self-sterile, and cross-pollination required to assure a crop. Clusters medium in size, variable in shape, rather loose. Berries light to dark red, with lilac bloom, large, ovoid to spherical. Skin medium thin and rather tender. Flesh medium tough; juicy. Low in sugar and acidity. Flavor aromatic; somewhat foxy. Dessert quality good. Midseason. A home table grape. Suggested for the Ozark section of region 2.

GOETHE.—(Lab., Vin.) Origin, Massachusetts, 1852. Vine vigorous, hardy, variable in productiveness. Flowers self-fertile. Clusters medium in size, broad, variable in shape, medium compact. Berries light red, with thin gray bloom, large, ovoid to spherical. Skin thin and medium tough, adhering slightly to the pulp. Flesh fairly tender; juicy. Sugar content and acidity medium. Flavor sprightly; aromatic. Dessert quality good. Late. A home and local-market grape. Suggested for the western section of region 3, and the southern Great Plains section of region 7.

KEUKA.—(Vin., Lab.) Origin, New York, 1913. Vine fairly vigorous, medium hardy, productive. Flowers self-fertile. Cluster medium in size; compact. Berries dark red, with heavy bloom, medium in size, ovoid to spherical. Skin tender, adhering somewhat to the pulp. Flesh crisp and juicy, resembling vinifera grapes in sweetness and vinous flavor. Midseason. A home and local-market grape. Suggested for region 2.

LAST ROSE.—(Lin., Lab., Vin.) Origin, Texas, 1902. Vine vigorous, healthy, productive. Flowers self-sterile, and cross-pollination necessary to assure a crop. Cluster large, shouldered, compact. Berries red, medium in size, spherical, Skin thin, tough. Flesh medium tender; juicy. Quality good. Very late. A table, market, and juice grape. Suggested for the western part of region 3 and region 4.

LINDLEY.—(Lab., Vin.) Origin, Massachusetts, 1852. Vine very vigorous, fairly hardy, somewhat lacking in productiveness. Flowers self-sterile, and cross-pollination necessary to assure a crop. Clusters medium in size, tapering, commonly shouldered, rather loose. Berries maroon, with thin lilac bloom, large, spherical to ovoid. Skin thick and tough. Flesh fairly tender, juicy. Sugar content fairly high; acidity medium to low. Flavor vinous, rich, and spicy. Dessert quality excellent. Midseason. A home and local-market table grape. Ships well but is not sufficiently productive for large-scale planting, though in some regions yielding well. Suggested for Ozark sections of regions 2 and 3 and northern sections of regions 7 and 8.

LUCILE.—(Lab.) Origin, New York, about 1888. Vine vigorous, hardy, and productive. Flowers self-fertile. Clusters large, cylindrical, usually single-shouldered, very compact. Berries dark red, with thin lilac bloom, large, ovoid to spherical. Skin thin and tender, tends to crack badly. Flesh rather tough, juicy. Sugar content and acidity medium to low. Foxy in flavor. Dessert quality fair. Midseason. A home table grape. Suggested for region 2 and the Ozark section of region 3.

LUTIE.—(Lab.) Origin, Tennessee; introduced in 1885. Vine fairly vigorous, healthy, hardy, but rather low in productiveness. Flowers self-fertile. Clusters medium to small, usually cylindrical, compact. Berries dark red, with lilac bloom, medium in size, spherical to ovoid. Skin intermediate in thickness and toughness, adhering somewhat to the pulp. Flesh rather tough; moderately juicy. Sugar content and acidity medium. Foxy in flavor. Dessert quality fair to good. Early to midseason. A home table grape. Does not keep or ship well. Suggested for the southeastern and southern sections of regions 3 and 4.

SALAMANDER.—(Cha., Lab., Vin., Bou.) Origin, Texas. Vine vigorous, hardy, productive. Flowers self-fertile. Cluster medium in size, variable in shape, compact. Berries red, translucent, medium in size, spherical. Skin thin and tough. Flesh tender and juicy. Dessert quality good. Late. A home table grape. Suggested for region 4 and the southern Great Plains section of region 7.

URBANA.—(Lab., Vin.) Origin, New York; introduced in 1912. Vine variable in vigor, not always hardy, productive. Flowers self-fertile. Clusters medium to large, variable in shape, single-shouldered, medium compact. Berries light red, medium to large, ovoid to spherical. Skin thick, rather tough, adherent to the pulp. Flesh firm but tender. Sugar content medium to fairly high; acidity low. Flavor vinous, spicy. Dessert quality very good. Late. A home table grape. Keeping quality good. Suggested for region 2 and northern sections of regions 7 and 8.

VERGENNES.—(Lab.) Origin, Vermont, 1874. Vine vigorous to medium vigorous, somewhat lacking in hardiness, productive. Flowers self-fertile. Clusters medium, cylindrical to tapering, medium compact. Berries light red, with lilac bloom, medium to larger in size, ovoid to spherical. Skin thick but rather tender, adhering somewhat to the pulp. Flesh tender, juicy. Sugar content medium; acidity low. Flavor vinous; the foxiness of *labrusca* not apparent. Late. A home and market grape. Keeps and ships well. Suggested for more southern sections of region 2, region 3, and northern sections of regions 7 and 8.

Black or Blue varieties

AMERICA.—(Lin., Rup.) Origin, Texas, 1885. Vine vigorous, healthy, rather low in productiveness unless cross-pollinated. Beacon and Concord are good pollinizers for this variety. Flowers only partially self-fertile. Clusters medium in size, tapering, medium compact. Berries black, with little bloom, medium in size, spherical. Skin thin and tender. Flesh tender and juicy. Sweet and agreeably acid when fully ripe. Aromatic, sprightly flavor. Medium late to late. A good juice and wine grape. Suggested for the Ozark and western sections of region 3 and for region 4.

BACCHUS.—(Rip., ?Lab.) Origin, New York; first exhibited in 1879. Vine very vigorous, healthy, hardy, productive. Flowers self-fertile. Clusters small to medium, cylindrical, sometimes single-shouldered, compact. Berries black, with blue bloom, small, spherical. Skin thin, tough. Flesh medium tough. Sugar content fairly high when fully ripe; acidity high. Flavor vinous, somewhat spicy. Midseason to late. Keeps well. A good jelly and wine grape. Suggested for region 1, possibly for selected sites in region 5, and for region 6.

BAILEY.—(Lin., Lab., Vin.) Origin, Texas, 1886. Vine vigorous, hardy in

regions suggested but injured in severe northern winters, productive. Flowers self-fertile. Clusters large, cylindrical to tapering, sometimes shouldered, compact. Berries black, with blue bloom, large, spherical to ovoid. Skin thin, tough, adhering somewhat to the pulp. Flesh tender and juicy. Sugar content fairly high; acidity medium. Flavor vinous, sprightly. Dessert quality good. Late. A home and market table grape. Suggested for the southeastern, southern, and western sections of region 3, region 4, and selected locations in the southern Great Plains section of region 7.

BARRY.—(Lab., Vin.) Origin, Massachusetts, 1852. Vine vigorous, hardy, variable in productivity. Flowers self-sterile and cross-pollination necessary to assure a crop. Clusters medium in size, usually tapering, sometimes double-shouldered, medium compact. Berries black, with blue bloom, large, ovoid to spherical. Skin thin but tough, adhering somewhat to the pulp. Flesh tender. Flavor vinous, aromatic. Dessert quality good. Late. Keeps well. A home table grape. Suggested for the Ozark section of region 2 and northern sections of region 7.

BEACON.—(Lin., Lab.) Origin, Texas, 1886. Vine generally vigorous, healthy, hardy in the regions suggested, productive. Clusters large, cylindrical, often shouldered, medium compact (fig. 3, *C*). Berries black, with heavy blue bloom, large, spherical. Skin medium thick and tough, adhering somewhat to the pulp. Flesh tender. Sugar content and acidity medium. Flavor vinous, aromatic, spicy. Dessert quality when fully ripe, good. Late. A home and local-market grape. Suggested for the western section of region 3, for region 4, and selected locations of the southern Great Plains section of region 7.

BETA.—(Rip., Lab.) Origin, Minnesota, about 1870. Vine vigorous, very hardy, productive. Flowers self-fertile. Clusters small to medium, cylindrical to tapering, single-shouldered, medium loose. Berries black, with blue bloom, small to medium in size, spherical. Skin thin and tender. Flesh medium tender; juicy. Sugar content and acidity high. Flavor vinous, spicy, aromatic. Early. A home grape suitable for jelly and juice making. Suggested for region 1, possibly for selected locations in region 5, and for region 6.

CAMPBELL EARLY.—(Lab., Vin.) Origin, Ohio; fruited first in 1892. Vine medium vigorous to vigorous, hardy, productive. Flowers self-fertile. Clusters varying in size from medium to large, usually tapering, commonly single-shouldered, medium compact. Berries black, with heavy blue bloom, large, spherical to ovoid. Skin medium thick, tough, adhering somewhat to the pulp. Flesh rather tough, juicy. Sugar content medium; acidity low. Flavor vinous, with only a trace of foxiness. Dessert quality good. Early to midseason. A home and market table grape. Shipping and keeping qualities good. Suggested for northern sections of regions 7 and 8.

CARMAN.—(Lin., Lab., Vin.) Origin, Texas, 1883. Vine vigorous, hardy, somewhat lacking in productiveness. Flowers self-fertile. Clusters varying in size from medium to large, shouldered or branched, tapering, compact. Berries black with blue bloom, medium in size, spherical to ovoid. Skin fairly thin, tough. Flesh tender but not juicy. Sugar content medium; acidity low. Flavor sprightly, aromatic. Dessert quality fair. Late. A home and market table grape. Suggested for region 4 and the southern Great Plains section of region 7.

CHAMPANEL.—(Cha., Lab.) Origin, Texas, 1893. Vine very vigorous, healthy, hardy in the districts suggested, fairly productive. Flowers self-fertile. Clusters medium, tapering, rather loose. Berries black, with whitish bloom, medium to larger in size, spherical. Skin rather thick and tough. Flesh tender, juicy. Sugar content low; acidity high. Flavor sprightly. Dessert quality rather low. Midseason. A grape for home use; quality not sufficient for commercial growing. Valuable because of resistance to diseases. Sometimes used as a root-stock. Suggested for the western part of region 3 and for region 4.

CLINTON.—(Rip., Lab.) Origin, New York; planted from the wild in 1821. Vine vigorous, hardy, productive. Flowers self-fertile. Clusters small to medium, cylindrical, commonly single-shouldered, medium compact. Berries black, with blue bloom, medium to small in size, spherical. Skin thin, tough. Flesh tender and juicy. Sugar content fairly high; acidity high. Flavor vinous, spicy. Too tart for dessert use. Good for jelly and wine. Midseason. Suggested for region 1, possibly for selected locations in region 5, and for region 6.

CLOETA.—(Lin., Rup., Lab., Vin.) Origin, Texas; introduced in 1902. Vine very vigorous, healthy, hardy, and productive. Flowers self-fertile. Clusters medium in size, usually tapering, medium compact. Berries black, with blue bloom, medium in size, spherical. Skin fairly thick and tough. Flesh tender

and juicy. Medium in sugar content and acidity. Flavor sprightly. Dessert quality fair to food. Midseason to late. A table, market, and wine grape. Suggested for the Ozark section of region 3, region 4, and parts of the southern Great Plains section of region 7.

CONCORD.—(Lab.) Origin, Massachusetts, about 1844. Vine vigorous, hardy, and productive. Flowers self-fertile. Clusters medium to large, broadly tapering, usually single-shouldered, medium compact (fig. 3, *D*). Berries black, with abundant blue bloom, large, spherical. Skin thick and rather tough, adhering slightly to the pulp. Flesh rather tough, juicy. Sugar content and acidity medium. Flavor foxy, aromatic. Dessert quality good. Midseason. A standard all-purpose grape, more widely cultivated than any other American variety. Suggested for region 2, eastern and Ozark sections of region 3, and northern sections of regions 7 and 8.

CYNTHIANA.—(Probably Aes.) Origin, Arkansas; first listed in 1881. Vine very vigorous, healthy, hardy, and medium to good in productiveness. Flowers self-fertile. Clusters medium in size, tapering to cylindrical in shape, compact. Berries black, with blue bloom, small, spherical. Skin thin but tough; somewhat adherent to the pulp. Flesh rather tough; juicy. Sugar content and acidity high. Flavor spicy. Too tart for a dessert grape. Late. Primarily a wine grape. Sometimes used as a rootstock. Suggested for the Ozark section of region 3.

EXTRA.—(Lin., Lab., Vin.) Origin, Texas, 1886. Vine fairly vigorous, hardy in the regions suggested, productive. Flowers self-fertile. Clusters large, cylindrical, sometimes shouldered, moderately compact. Berries black, with blue bloom, medium to large, spherical. Skin thin, fairly tough. Flesh tender, juicy. Sugar content medium; acidity medium to high. Flavor sprightly, agreeable. Midseason to late. A home and market grape for table and wine. Where a rootstock is required, R. W. Munson and selections of *Vitis champini* serve well. Suggested for regions 3 and 4 and the southern Great Plains section of region 7.

FERN MUNSON.—(Lin., Lab., Vin.) Origin, Texas, 1883. Vine vigorous, hardy, fairly productive. Flowers self-fertile. Clusters medium to large, tapering, medium compact. Berries purplish black, with blue bloom, medium in size, spherical. Skin thin; tough. Flesh firm, tender, juicy. Flavor sprightly; agreeable when fully ripe. Very late. A home and market table grape. Suggested for region 4.

FREDONIA.—(Lab.) Origin, New York, 1915. Vine vigorous, hardy, somewhat variable in productiveness. Flowers self-fertile. Clusters medium in size, cylindrical, compact. Berries black, with heavy blue bloom, large spherical. Skin thick, medium tough. Flesh tender but firm, juicy. Sugar content and acidity medium. Flavor aromatic, somewhat foxy. Dessert quality good. Early. Keeps and hangs well to vine. A good shipper. Suited to home, local-market, and commercial growing. Where rootstocks are required, Dog Ridge and selections of *Vitis champini* serve well for this variety. Suggested for regions 2 and 3, region 4 when grown on a suitable rootstock, favored locations in region 6, and northern sections of regions 7 and 8.

HERBEMONT.—(Bou.) Origin uncertain; growing in Georgia prior to the Revolutionary War. Vine vigorous, healthy, not hardy at temperatures below 0° F., productive. Flowers self-fertile. Clusters above medium to large, tapering, shouldered, very compact. Berries purple to black, with abundant blue bloom, small, spherical. Skin thin; rather tough. Flesh tender; juicy. Sugar content relatively high, acidity above medium. Flavor agreeable; sprightly. Dessert quality good. Late. Primarily a red-wine grape but also used as a table grape. Suggested for region 4.

HERBERT.—(Lab., Vin.) Origin, Massachusetts, 1852. Vine vigorous, somewhat lacking in hardiness in severe winters, variable in productiveness. Flowers self-sterile, and cross-pollination required to assure a satisfactory crop. Clusters medium in size, variable in shape, medium compact. Berries dull black, with blue bloom, above medium to large, spherical. Skin thick and tough, somewhat adherent to the pulp. Flesh medium tender, juicy. Sugar content relatively high; acidity medium. Flavor sprightly, aromatic, with some foxiness. Dessert quality very good. Midseason. A home table grape. Production too variable for commercial planting. Suggested for Ozark sections of regions 2 and 3.

ISABELLA.—(Lab. ?Vin.) Origin uncertain; probably in one of the Carolinas prior to 1800. Vine vigorous to medium vigorous, usually hardy, variable in productiveness. Flowers self-fertile. Clusters large to medium, usually taper-

ing, sometimes single-shouldered; compactness variable. Berries black, with heavy blue bloom, ovoid. Skin rather thick, tough, somewhat adherent to the pulp. Flesh tender but meaty, juicy. Sugar content and acidity fairly high. Flavor sprightly; aromatic. Dessert quality good. Late. Primarily a home table grape. Suggested for region 8.

IVES.—(Lab., ?Aes.) Origin, Ohio, about 1841. Vine vigorous, hardy, productive. Flowers self-fertile. Clusters in medium size, tapering to cylindrical, sometimes single-shouldered, medium compact. Berries black, with blue bloom, medium in size, ovoid to spherical. Skin thick and tough adhering somewhat to the pulp. Flesh tough; juicy. Medium in sugar content and acidity. Flavor foxy. Dessert quality fair. Keeps well. Late midseason to late. Primarily valuable as a red-wine grape. Suggested for region 2, the Ozark section of region 3, and the northern section of region 7.

LENOIR.—(Bou.) Origin uncertain. Vine vigorous, somewhat lacking in hardiness, fairly productive. Flowers self-fertile. Clusters large, tapering, usually shouldered. Berries nearly black, with blue bloom, medium to below medium in size, spherical. Skin thin and tough. Flesh tender, somewhat juicy. Sugar content medium; acidity rather high. Dessert quality fair. Very late. Primarily a red-wine grape, though used to some extent as a table grape. Suggested for the western section of region 3, region 4, and the southern Great Plains section of region 7.

LOMANTO.—(Cha., Lab., Vin., Bou.) Origin, Texas, 1902. Vine fairly vigorous, hardy in the regions suggested, productive. Flowers self-fertile. Clusters medium tapering, medium compact. Berries black, medium in size, spherical. Skin thin but tough. Flesh tender, juicy. Sugar content low; acidity rather high. Flavor pleasing, aromatic. Dessert quality fair. Midseason. Principal value is the making of red wine. Suggested for the Ozark section of region 3, region 4, and selected sections in the southern Great Plains section of region 7.

MANITO.—(Lin., Rup., Bou., Lab., Vin.) Origin, Texas. Introduced in 1899. Vine vigorous, hardy, productive. Flowers self-fertile. Clusters medium in size, long, cylindrical, loose. Berries purplish black, with light spots and blue bloom, medium in size, spherical. Skin thin, tender, adhering somewhat to the pulp. Flesh tender and juicy. Sugar content and acidity medium. Flavor distinctive, aromatic. Dessert quality good. Early to midseason. Keeps and ships well. A table and wine variety. Suggested for the western section of region 3, region 4, and the southern Great Plains section of region 7.

MARGUERITE.—(Lin., Bou.) Origin, Texas, 1886. Vine very vigorous, hardy, productive. Flowers self-fertile. Clusters medium to small, cylindrical, shouldered, compact. Berries black, with blue bloom, small, spherical. Skin medium in thickness and toughness. Flesh medium tender; juicy. Sugar content and acidity high. Flavor pleasing, sprightly. Too tart for table use. Late. Principal value is for juice and wine making. Suggested for region 4.

MERRIMAC.—(Lab., Vin.). Origin, Massachusetts, 1852. Vine vigorous, somewhat lacking in hardiness in severe winters, variable in productivity. Flowers self-sterile; cross-pollination required to assure a crop. Clusters variable in size, shape, and compactness. Berries black, with blue bloom, large, spherical. Skin thick and tough, adhering somewhat to the pulp. Flesh medium tender, juicy. Flavor agreeable. Dessert quality good. Midseason. A home table grape. Suggested for the Ozark section of region 2.

MOORE EARLY.—(Lab.) Origin, Massachusetts; first exhibited in 1871. Vine of medium vigor, hardy, medium in productiveness. Flowers self-fertile. Clusters medium in size, variable in shape, rather loose. Berries purplish black, with blue bloom, large to above medium in size, spherical. Skin thick, medium tender; tends to crack badly; somewhat adherent to the pulp. Flesh tough, juicy. Sugar content rather low; acidity medium. Somewhat foxy in flavor. Dessert quality fair. Early. A home and market table grape. Suggested for region 2.

MUENCH.—(Lin., Bou.) Origin, Texas, about 1887. Vine very vigorous, hardy in the regions suggested, medium in productiveness. Flowers self-fertile. Clusters large, usually shouldered, compact. Berries dark purple to black, medium in size, spherical. Skin thin but tough. Flesh tender, juicy. Flavor pleasing, aromatic. Dessert quality fair. Late. A juice and wine grape. Suggested for the Ozark section of region 3, region 4, and the southern Great Plains section of region 7.

PIERCE.—(Lab., ?Vin.) Origin, California, about 1882. Vine vigorous, productive. Flowers self-fertile. Clusters large, fairly compact. Berries black,

with light bloom, large, spherical. Skin medium thick and rather tender. Flesh tender. Sweet. Flavor strongly aromatic. Dessert quality good. Late. A home table grape. Suggested for region 8.

R. W. MUNSON.—(Lin., Lab., Vin.) Origin, Texas, 1886. Vine vigorous, healthy, hardy in the regions suggested, productive. Flowers perfect but not always fully self-fertile, and cross-pollination is required to assure a crop. Brilliant is a good pollinizer for this variety. Clusters medium in size, cylindrical, sometimes shouldered, medium compact. Berries black, without bloom, medium in size, spherical. Skin medium in thickness, tough. Flesh tender, juicy. Dessert quality good. Midseason. A table grape for the home and local market. Ships well. This grape is also valuable as a rootstock variety. Suggested for region 4 and the southern Great Plains section of region 7.

SHERIDAN.—(Lab., Vin.) Origin, New York; introduced in 1921. Vine vigorous, hardy, productive, Flowers self-fertile. Clusters large, cylindrical to tapering, usually shouldered, compact. Berries black, with heavy bloom, large spherical. Skin thick and medium tough. Flesh firm, juicy. Sugar content and acidity medium. Flavor aromatic. Dessert quality good. Late. A table grape for home and market. Keeps well. Suggested for region 2, eastern sections of region 3, and northern sections of regions 7 and 8.

VAN BUREN.—(Lab.) Origin, New York; introduced in 1935. Vine vigorous, hardy, moderately productive. Flowers self-fertile. Clusters medium in size, somewhat variable in shape, compact. Berries black, medium to larger in size, spherical. Skin medium in thickness and toughness. Flesh medium tender, juicy. Sugar content and acidity medium. Dessert quality good. Very early. A table grape for home and local market. Not suited for long shipment. Suggested for region 2 and northern sections of regions 7 and 8.

WESTFIELD.—(Lab., Vin.) Origin, New York; introduced in 1935. Vine vigorous, hardy, productive. Flowers self-fertile. Clusters medium in size, somewhat variable in shape, very compact. Berries black, with abundant bloom, medium in size, spherical to ovoid. Skin medium in thickness and toughness. Flesh firm, juicy. Sugar content fairly high. Dessert quality fair. Midseason. Primarily a juice and red-wine grape. Suggested for region 2 and northern sections of regions 7 and 8.

WORDEN.—(Lab.) Origin, New York, about 1864. Vine vigorous, hardy, healthy, and moderately productive. Flowers self-fertile. Clusters medium to large, cylindrical to tapering, usually single-shouldered, medium compact. Berries black, with heavy blue bloom, large, spherical to ovoid. Skin medium in thickness, rather tender, tends to crack badly, adhering somewhat to the pulp. Flesh tough, juicy. Sugar content and acidity medium. Flavor somewhat foxy. Dessert quality good. Midseason. A home and local-market grape. Does not hang well on the vines or ship well. Suggested for region 2, eastern section of region 3, favored sections of region 6, and northern sections of regions 7 and 8.

MUSCADINE GRAPES

CREEK.—A seedling of San Monta, developed at the Georgia Experiment Station. Vine vigorous, productive. Clusters fairly large. Berries reddish purple, medium in size, fairly persistent. Skin thin, flesh juicy, with fine fruity flavor. Sugar and acid content fairly high. A table, juice, and wine grape. Late.

CRESWELL.—Originated near Creswell, N. C. Vine vigorous, productive. Clusters medium in size. Berries black, medium to large, persistent. Skin medium thin, tough. Flesh melting, juicy. Sweet and of fine flavor. An excellent table grape. Late.

DULCET.—A seedling of Irene, developed at the Georgia Experiment Station. Vine vigorous and productive. Clusters medium in size. Berries reddish purple, medium in size, very persistent. Skin medium in thickness and toughness. Sugar content fairly high; acidity low. Dessert quality good. Midseason.

EDEN.—Discovered in the wild near Atlanta, Ga. Vine vigorous, very productive. Clusters medium in size, rather loose. Berries dull black, medium or smaller in size, fairly persistent. Skin medium thin and tender. Flesh soft, juicy, with pleasing sprightly flavor. Early.

HUNT.—A seedling of Flowers, developed at the Georgia Experiment Station. Vine vigorous and very productive. Clusters large. Berries black, medium to large in size, persistent. Skin fairly thin. Flesh medium tender, juicy. Sugar content and acidity medium. Dessert quality excellent. A fine table grape for home and local market. Early.

JAMES.—Discovered in the wild in Pitt County, N. C. Vine vigorous and productive. Clusters medium in size. Berries black, large, fairly persistent. Skin

thick and tough. Flesh meaty, juicy. Dessert quality fair. An all-purpose grape for home and local market. Late.

MEMORY.—Probably a seedling of Thomas; originated at Whiteville, N. C. Vine fairly vigorous, productive. Clusters rather small. Berries black, large, fairly persistent. Skin thick and tough. Flesh medium in texture and juiciness. Sugar content and acidity medium. Dessert quality fair. A home and local-market grape. Midseason.

MISH.—Discovered in the wild near Washington, N. C. Vine vigorous and very productive. Clusters medium in size. Berries purplish black, of medium size, fairly persistent. Skin fairly thin; cracks somewhat in wet weather. Flesh tender, juicy, and sweet. Distinctive pleasing flavor. An all-purpose grape esteemed especially for wine making. Late.

SCOTT.—Also known as Black Beauty. Discovered in the wild in eastern North Carolina. Vine vigorous, productive. Clusters medium in size. Berries black, large, sweet, and of fine flavor, fairly persistent. A home and local-market grape. Early.

SCUPPERNONG.—Discovered in the wild; origin uncertain, but probably Tyrrell County, N. C. Vine vigorous; of medium productiveness only. Clusters rather small. Berries pearly green to bronze, large; shatter rather badly. Skin fairly thick and tough. Flesh tender, juicy. Sugar content and acidity medium. Flavor distinctive, very fine. Dessert quality excellent. The most popular white muscadine grape. A table and wine variety for the home and local market. Early.

THOMAS.—Discovered in the wild near Marion, S. C. Vine vigorous and very productive. Clusters medium in size (fig. 3, *B*). Berries reddish purple, medium in size, shatter rather badly. Skin thin and moderately tough. Flesh tender, juicy. Sugar content medium; acidity low. Flavor rich, sprightly. Dessert quality excellent. A fine table and juice grape for home and local market. Early midseason.

YUGA.—A seedling of San Monta, developed at the Georgia Experiment Station. Vine vigorous and very productive. Clusters large. Berries light bronze to reddish amber, medium in size, very persistent. Skin thin. Flesh tender, juicy. Sugar content high; acidity medium. Dessert quality very good. A home and local-market table grape. Late.

DESCRIPTION OF VINIFERA VARIETIES

In this section are given the origin and a brief general characterization of the principal vinifera grape varieties mentioned in the discussion. All of these are *Vitis vinifera* except Salvador, which is probably a vinifera hybrid. Typical clusters of some varieties are shown in figure 4.

AGADIA.—Native name Agadai. Origin, Russia. Vine vigorous, healthy, productive; cane pruning required. Flowers self-fertile. Clusters medium to large, irregular to cylindrical, shouldered, usually compact. Berries cream to light yellow, large, oblate to elongated ellipsoidal. Skin medium thin, adhering to pulp. Pulp very firm, meaty, medium sweet, slightly astringent. Medium late. A shipping and storage type. This grape has size, firmness, and attractive yellow color but low eating quality. Suggested for the central section of region 9.

ALEATICO.—Origin, Italy. Vine medium in vigor and productiveness, bearing well with spur pruning. Flowers self-fertile. Clusters medium in size, conical, well-filled to compact. Berries dark red to black, medium in size, spherical to slightly oblate. Skin medium thin. Pulp medium juicy, sweet; delicate muscat flavor. Midseason. Principally a wine type but suitable for home and local market. Suggested for central and southern sections of region 9.

ALICANTE BOUSCHET.—Origin, France. Vine of medium vigor, productive; spur pruning required. Flowers self-fertile. Clusters medium in size, conical to heavy-shouldered, compact. Berries black, medium in size, spherical. Skin medium thin. Pulp firm to fairly juicy; juice red. Midseason. A wine type, widely used as a shipping juice type. This variety stands third in bearing acreage (1939) of wine types in California. Widely planted in region 9.

ALICANTE GANZIN.—Origin, France. Vine of medium vigor, productive; spur pruning required. Flowers self-fertile. Clusters medium in size, conical, shouldered, medium to compact. Berries black, below medium in size, ellipsoidal. Skin medium thin. Pulp medium to soft, juicy, red, sweet. Early midseason. A wine grape, not extensively grown. Suggested for region 9 and for trial in vinifera section mentioned in regions 7 and 8.

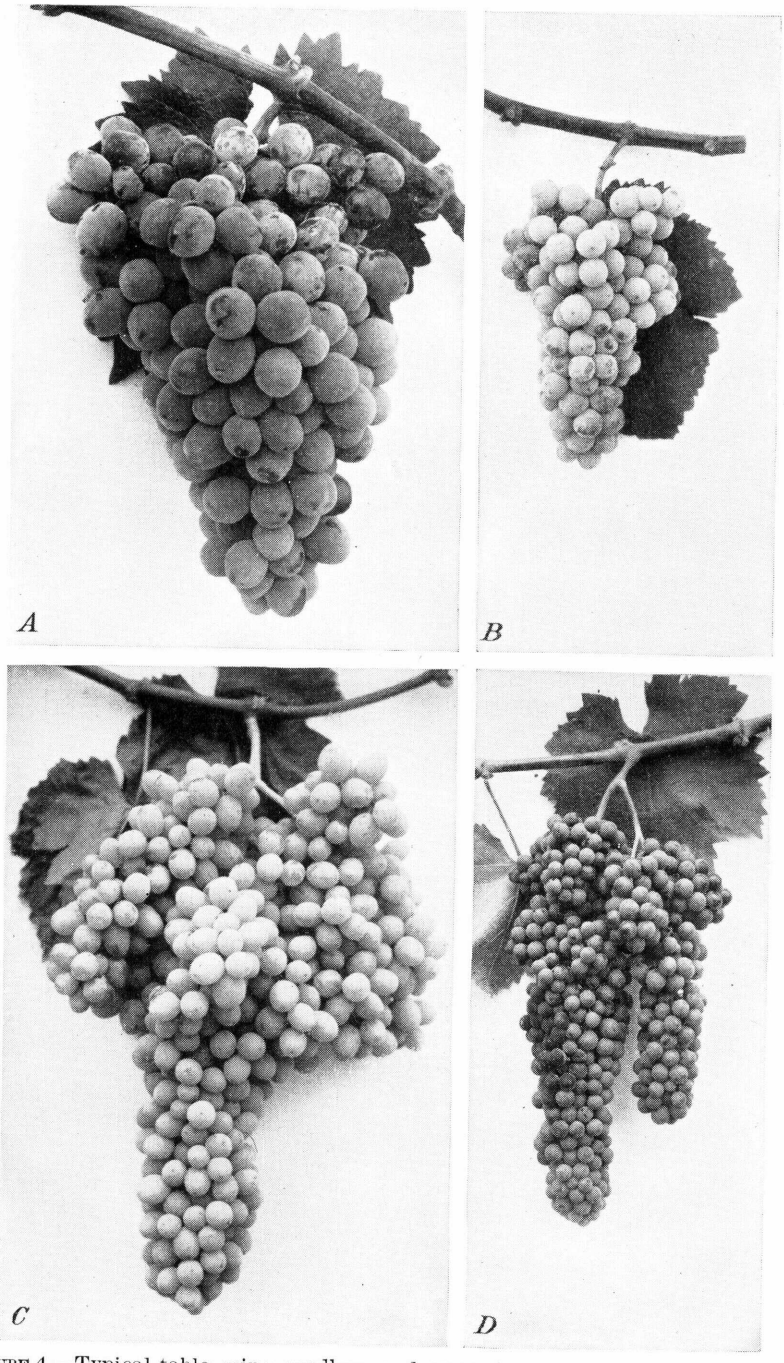

FIGURE 4.—Typical table, wine, seedless, and currant grapes of the vinifera type: *A*, Flame Tokay, a standard table variety; *B*, Semillon, a wine grape; *C*, Sultanina (Thompson Seedless), a seedless variety; *D*, Corinthe Noir, a currant grape. All one-fifth natural size.

ALPHONSE LAVALLEE.—Commercially known as Ribier. Origin, France. Vigorous, productive; spur pruning required. Flowers self-fertile. Clusters large, conical, very loose to well-filled, occasionally compact. Berries black, large to very large, usually oblate with striated markings at the apex; some berries elongated. Skin thick. Pulp firm, crisp, meaty, medium sweet. Early midseason. An important table and shipping grape; can be stored for later shipment. Grown widely in central and southern sections of region 9.

ARAMON.—Also known as Burkhardt. Origin, France. Vine vigorous, very productive; spur pruning required. Flowers self-fertile. Clusters large, conical, shouldered, compact. Berries reddish black to black, large, spherical. Skin thin. Pulp soft, juicy, medium to poor in quality. Midseason. Formerly grown for bulk-wine purposes; now rarely planted. Adapted to the warmer parts but colors better in the cooler sections of region 9.

BARBERA.—Origin, Italy. Vine medium in vigor and productiveness; spur pruning required. Flowers self-fertile. Clusters medium in size, conical, slightly shouldered, compact. Berries black, small, spherical to obovoid, pressed out of shape in cluster. Skin medium to thin. Pulp crisp, juicy; of good quality. Midseason to late. A dry-wine type of high quality. The lack of vine vigor and productivity is a disadvantage for general planting. Suggested for region 9.

BECLAN.—Origin unknown. Vine medium to small in growth, medium in productiveness; spur pruning required. Flowers self-fertile. Clusters small to medium, cylindrical, shouldered, very compact. Berries black, small, spherical. Skin thin. Pulp medium tender, juicy. Early to midseason. A dry-wine type. Suggested for the cooler parts of region 9.

BLACK HAMBURG.—Origin, Germany. Vine vigorous, productive; spur or short-cane pruning required. Flowers self-fertile. Clusters medium large, cylindrical, shouldered, compact. Skin thin but tough. Pulp melting, juicy, sweet, neutral in flavor. Medium late. Mainly a home and local-market grape; rather soft for distant shipments. Occasionally used for wine purposes. The "Hampton Court" vine of England. In California the name frequently applied erroneously to the variety Danugue. Suggested for central and cooler sections of region 9.

BLACK MONUKKA.—Origin, India. Vine very vigorous, productive; spur pruning required. Flowers self-fertile. Clusters large, very long, irregular to cylindrical, shouldered, loose to compact. Berries reddish black to black, below medium in size, cylindrical. Skin thin. Pulp firm, meaty, not high in sugar, neutral but pleasing in flavor, seedless. Early. A fine variety for home use; a special raisin type, not widely grown. Colors better in the cooler areas in region 9 but is also adapted to the warmer locations.

BLACK MOROCCO.—Origin unknown. Vine vigorous, productive; spur pruning required. Flowers self-fertile. Clusters medium to large, rather short cylindrical, shouldered, compact. Berries reddish black to black, large, spherical to slightly obovoid, pressed out of shape by compactness of cluster. Skin tough. Pulp rather firm, meaty, not high in sugar. Late. This variety is characterized by the production of second-, third-, and fourth-crop clusters during the season. A late table and shipping grape. The plantings of the variety are limited. Does not ripen properly in the cooler parts of region 9 and not especially adapted to the warmest localities. Suggested for the moderate central locations of region 9.

BURGER.—Origin, Germany (?). Vine vigorous, productive; spur pruning required. Flowers self-fertile. Clusters large, conical, shouldered, very compact. Berries yellowish green, medium in size, spherical. Skin thin, tender. Pulp soft, very juicy, sprightly in flavor. Midseason. A white-dry-wine type. Formerly grown in both cool and hot locations of region 9; now more common in the cooler parts.

CABERNET SAUVIGNON.—Origin, France. Vine vigorous, productive; spur or short-cane pruning required. Flowers self-fertile. Clusters medium in size, conical, shouldered, usually well-filled to compact. Berries black, medium to small, nearly spherical. Skin medium tough. Pulp medium tender, fairly juicy, distinctive in flavor. Midseason to late. A special-quality red-dry-wine type developing especially well in the cooler locations in region 9.

CARIGNANE.—Origin, Spain. Vine very vigorous, productive; spur pruning required. Flowers self-fertile. Clusters medium in size, cylindrical, shouldered, medium compact. Berries black, medium in size, ellipsoidal. Skin medium thick. Pulp melting, juicy. Midseason to slightly later. A red-wine variety utilized both in sweet- and dry-wine manufacture. It is listed as second in bearing acreage of wine grapes in California. It is extensively planted in the warmer valleys as well as the cool localities in region 9. It appears better

adapted to the moderately warm locations than to the hotter sections of region 9.

CASTIZA.—Also known as Molinera; commercially known as Red Malaga. Origin, Spain. Vine vigorous, productive; spur or short-cane pruning required. Flowers self-fertile. Clusters large, conical to irregular in shape, variable in compactness. Berries red, large, spherical or obovoid. Skin thin, tough. Pulp firm, crisp, meaty, neutral in flavor. Early midseason. An important table and shipping grape. Widely planted in the warmer valleys of region 9. Develops better color in the cooler locations but is very susceptible to rain damage.

CHASSELAS DORÉ.—Also known as Gutedel and Golden Chasselas. Origin unknown. Vine medium in vigor, productive; spur pruning required. Flowers self-fertile. Clusters medium in size, cylindrical, shouldered, medium compact. Berries pale greenish yellow, nearly transparent, medium in size, spherical. Skin thin, tender. Pulp soft, juicy, sweet. Early midseason. A white-dry-wine type; also suitable for home and local table market. Mainly planted in the cooler locations of region 9. On account of the shorter season required, suggested for vinifera locations in regions 7 and 8.

CINSAUT.—Also known as Black Malvoisie. Origin, France(?). Vine medium in vigor; very productive; spur pruning required. Flowers self-fertile. Clusters medium in size, conical, shouldered, medium compact. Berries black, medium to slightly larger, ovoid to slightly elongated. Skin medium thick. Pulp medium firm, juicy, sweet. Early midseason. A sweet-wine type but also somewhat used as an early local table grape. Well adapted to region 9 and suggested for vinifera areas in regions 7 and 8.

COLOMBAR.—Commonly and erroneously known as Sauvignon Vert. Origin, France. Vine very vigorous; productive; spur or short-cane pruning required. Flowers self-fertile. Clusters medium in size, long, cylindrical, shouldered, medium compact to fairly loose. Berries greenish yellow, medium to small, nearly spherical. Skin thin. Pulp soft, juicy, sprightly in flavor. Midseason. A white-dry-wine type. Suggested for the warmer areas of the northern section of region 9.

CORINTHE NOIR.—Also known as Zante Currant grape. Origin, Greece. Vine vigorous, productive with annual ringing; cane pruning required. Flowers self-fertile. Clusters small to medium, cylindrical, usually winged, compact with ringing (fig. 4, *D*). Berries reddish black to black, very small, spherical. Skin thin. Pulp soft, juicy, high in sugar and acidity, seedless; some seeded berries produced. Early. This grape is dried to make the "Zante Currant" raisin of commerce. It is also sold fresh for local use. It is widely adapted in region 9, generally grown in the warmer interior valleys.

DANUGUE.—Also known as Gros Guillaume. Origin unknown. Vine vigorous, very productive, either spur or cane pruning satisfactory. Flowers self-fertile. Clusters very large and long, conical, shouldered, medium to compact. Berries dark reddish black to black, nearly spherical. Skin thick, tough. Pulp firm, sweet, pleasing in flavor. Medium to late. Principally a table and local-market type. On account of heavy production it is utilized to some extent for distilling material. Quite frequently erroneously called Black Hamburg in California. Suggested for warmer locations in region 9.

EMPEROR.—Origin unknown. Vine very vigorous, productive, long-spur or short-cane pruning required. Flowers self-fertile. Clusters very large, long, conical, shouldered, fairly loose to well-filled. Berries light to dark red, large obovoid, slightly elongated. Skin medium tough. Pulp firm, meaty. Late. A late shipping and storage grape. Ranks second in acreage of red table grapes in California, and the leading storage grape. Mainly planted in the central section of region 9.

FEHER SZAGOS.—Origin unknown. Vine vigorous, very productive; spur pruning required. Flowers self-fertile. Clusters medium in size, conical to cylindrical, shouldered, medium compact to compact. Berries greenish yellow, medium in size, ellipsoidal to ovoid. Skin medium thin. Pulp very soft, juicy, sweet, high in sugar. Midseason. Mainly a wine type; utilized in sherry manufacture and as distilling material; can be used for curing into raisins. Grown mainly in the warmer locations and the central section of region 9.

FLAME TOKAY.—Origin, Africa. Vine vigorous, productive; spur pruning required. Flowers self-fertile. Clusters medium to large, conical, shouldered, compact (fig. 4, *A*). Berries bright red, large ovoid, truncate. Skin medium thin, tough. Pulp very firm, meaty. Midseason to slightly later. An important table and shipping grape. Ranks first in acreage of red table grapes. Mainly produced in the north-central section of region 9. Isolated plantings in region 8.

GRAND NOIR.—Also known as Grand Noir de la Calmette. Origin, France. Vine medium in vigor, productive; spur pruning required. Flowers self-fertile.

Clusters medium in size, conical, shouldered, medium compact. Skin fairly tough. Pulp soft, juicy; red-colored juice, sweet. Medium early. A red-coloring type mainly utilized for dry wine. Generally adapted to cooler sections of region 9.

GREEN HUNGARIAN.—Origin unknown. Vine vigorous, very productive; spur pruning required. Flowers self-fertile. Clusters medium large, cylindrical, shouldered, medium compact. Berries light green, medium in size, spherical. Skin thin, tender. Pulp soft, juicy, of fair quality. Midseason to late. A white-dry-wine type. Mainly produced in cooler coastal valleys of region 9.

GRENACHE.—Origin, Spain. Vine very vigorous, very productive; spur pruning required. Flowers self-fertile. Clusters medium to large, short conical, heavily shouldered, very compact. Berries dark red to black, medium in size, spherical to ovoid. Skin medium tender. Pulp soft, juicy, sweet. Late midseason. Mainly a sweet-wine type but lacks color in the warmer areas. Grown in the central part, but fruit colors much better in the cooler sections of region 9.

GROS COLMAN.—Also known as Dodrelabi and Fresno Beauty. Origin, Caucasus region. Vine very vigorous, very productive, short-cane pruning required; wire trellising aids in better distribution of fruit. Flowers self-fertile. Clusters large, short conical, very compact. Berries black, large to very large, spherical to slightly oblate. Skin thick, medium tough, subject to splitting. Pulp medium to fairly soft, sweet, neutral in flavor. Late midseason. A home and local-market grape, although when carefully handled may be used for distant shipments. Widely planted but does not reach a large acreage. Grown as a hothouse grape in foreign countries. Suggested for warmer sections of region 9.

KAHALLILLEE.—Origin, Persia. Vine medium in vigor; production fair; cane pruning required. Flowers self-fertile. Clusters medium in size, conical, shouldered, compact. Berries greenish yellow, small, ovoid to ellipsoidal. Skin thin but tough. Pulp medium firm, neutral in flavor. Very early. An early table and shipping type grown mainly in the very warm valleys. The fruit somewhat resembles the Sultanina, but the berries contain seeds. Mainly important because of early maturity; not widely grown. Southern section of region 9.

KANDAHAR.—Origin, Persia. Vine vigorous, moderately productive; cane pruning required. Flowers self-fertile. Clusters large, conical, irregular, medium loose. Berries greenish yellow, very large, meaty. Early midseason. A table and shipping grape. Attractive in appearance and pleasing to eat. Its disadvantage is irregular production. Easily bruised in shipment. Warm central and southern sections of region 9.

MALAGA.—Origin, Spain (?). Vine very vigorous, very productive; spur pruning required; wire trellis may be utilized to advantage. Flowers self-fertile. Clusters large to very large. Conical, shouldered, medium compact. Berries yellowish to light amber, large, obovoid. Skin medium thin, tough. Pulp firm, meaty, neutral in flavor. Midseason. Ranks next to Sultanina in importance as a white table and shipping grape. Makes an edible raisin and is utilized in wine manufacture. Also used as a storage grape for a limited period. Widely planted in central and southern sections of region 9. Appears more generally adapted to the central part of this region.

MATARO.—Origin, Spain. Vine medium in vigor, productive; cane pruning required. Flowers self-fertile. Clusters medium in size, irregular, conical, shouldered, medium compact. Berries black, medium in size, spherical. Skin medium thin. Pulp fairly firm but juicy. Medium late. Mainly a red-wine type quite extensively grown. Appears adapted to moderately warm sections of region 9.

MISSION.—Origin, Spain (?). Vine vigorous, productive; cane pruning required. Flowers self-fertile. Clusters large, conical, shouldered, well-filled but not compact. Berries reddish black to black, small to medium, spherical. Skin medium thin. Pulp medium firm, juicy. Late. Mainly a sweet-wine type. This grape receives the credit of being the first vinifera variety introduced into California and planted around the early missions. It ranks fourth in acreage of wine varieties in California. Mainly produced in the warm interior and southern section of region 9.

MONDEUSE.—Also known as Gros Syrah. Origin, France (?). Vine vigorous, productive; spur pruning required. Flowers self-fertile. Clusters medium to large, conical, shouldered, medium compact. Berries black, ovoid to ellipsoidal. Skin thin, medium tough. Pulp soft, juicy, sweet. Medium late. A red-wine type not extensively planted. Appears adapted to the warmer parts of the northern coast valleys in region 9.

MUSCADELLE DU BORDELAIS.—Origin, France (?). Vine medium in vigor, productive, either spur or cane pruning satisfactory. Flowers self-fertile. Clusters small to below medium, cylindrical, only slightly shouldered, variable in compactness, ranging from loose to very compact. Berries green to light yellow, small, spherical. Skin thick, tough. Pulp soft, juicy, sweet; distinct muscat flavor. Early. A white-wine type mainly used for blending on account of its distinct flavor. Not extensively grown. Appears better adapted to the moderately warm locations rather than to either the hot valleys or the cooler coastal parts of region 9. Owing to the short season required may be grown in the vinifera sections of regions 7 and 8.

MUSCAT DE FRONTIGNAN.—Also known as Muscateller. Origin unknown. Vine medium in vigor, productive; either spur or cane pruning satisfactory. Flowers self-fertile. Clusters small to medium, cylindrical, slightly shouldered, very compact. Berries yellowish green, medium to small, spherical. Skin medium thin, tough. Pulp soft, juicy; delicate muscat flavor. Early midseason. A distinct white-wine type utilized for sweet wine and in blending for dry-wine types. The moderate vigor and the light possible production of this variety has limited its plantings. Adapted to central and northern sections of region 9.

MUSCAT HAMBURG.—Origin, England (?). Vine medium in vigor, productive; spur pruning required. Flowers self-fertile. Clusters medium in size, conical, shouldered, medium loose. Berries reddish black to black, obovoid. Skin thick, tough. Pulp rather soft, juicy, sweet; very distinct muscat flavor and delicate aroma. Midseason. Not extensively grown, utilized mainly for home use. Reported to be adapted to vinifera sections in regions 7 and 8. Develops more uniform fruit in cooler sections of region 9.

MUSCAT OF ALEXANDRIA.—Origin, Africa (?). Vine medium in vigor, productive; spur pruning required. Flowers self-fertile but setting of fruit erratic. Clusters variable, medium large, conical, irregular, very loose to medium compact. Berries, greenish yellow, large obovoid. Skin thin but tough. Pulp meaty, high in sugar; distinct muscat flavor. Midseason to medium late. Mainly a raisin type, ranking second in importance in California in raisin production. Extensively used as a table and sweet-wine type. Its flavor makes it a favorite home and local-market grape. Some shipments are made to distant markets for table use. Well adapted to warm regions and most extensively grown in warm central sections of region 9.

OHANEZ.—Commercially known as Almeria. Origin, Spain. Vine vigorous, productive; cane pruning required. Flowers have reflex stamens; will set fruit with its own pollen; cross-pollination may be advantageous. Clusters medium to large, short conical, shouldered, medium to compact. Berries light green to greenish yellow, occasionally developing a slight pink tinge when fully ripe, large, variable in shape, ovoid truncate to elongated cylindrical. Skin thick, very tough. Pulp firm, meaty, rather dry. Late. Noted for its shipping and storage qualities. The main white storage table grape. Frequently trained on an overhead trellis. Mainly planted in the warmer central sections of region 9.

OLIVETTE BLANCHE.—Origin, France (?). Vine very vigorous, productive; either spur or cane pruning satisfactory. Flowers self-fertile. Clusters very large, conical, shouldered, medium compact. Berries greenish yellow, large, elongated ovoid to fusiform. Skin thin, tough. Pulp firm, meaty, neutral in flavor. Medium late. A table and shipping grape. The elongated berries make an attractive appearance. Minor in commercial importance. Mainly grown in the central section of region 9.

OLIVETTE DE VENDEMIAN.—Origin unknown. Vine vigorous, productive; cane pruning required. Flowers have reflex stamens; pollination erratic. Clusters medium large, irregular, cylindrical, shouldered, loose to compact. Berries greenish yellow to light yellow, medium to large, obovoid, slightly elongated. Skin thick, tough. Pulp firm, meaty, dry. Late. Mainly a storage table grape. Not extensively grown. Adapted to the central section of region 9.

OLIVETTE NOIRE.—Commonly known as Cornichon. Origin, Italy (?). Vine vigorous, very productive; spur pruning required. Flowers self-fertile. Clusters medium to large, uniform, conical, shouldered, medium compact. Berries reddish black to purplish black, large, ellipsoidal, elongated. Skin thick, tough. Pulp soft, juicy, not high in sugar, neutral in flavor. Medium late. A shipping, storage, and table grape. Declining in importance. Adapted to the warmer central sections of region 9.

PALOMINO.—Erroneously known as Golden Chasselas. Origin, Spain. Vine very vigorous, productive; spur pruning required. Flowers self-fertile. Clusters

large, conical, shouldered and winged, loose to medium compact. Berries light green to yellow. Skin medium thin, tender. Pulp soft, juicy, sweet. Midseason to medium late. An important wine type, widely grown but appears better adapted to interior valleys of region 9.

PEDRO XIMINES.—Origin, Spain. Vine vigorous, productive; spur pruning required. Flowers self-fertile. Clusters medium large, shouldered, conical-cylindrical, medium compact. Berries light yellow to yellow, medium ovoid to slightly elongated ellipsoidal. Skin thin, medium tough. Pulp medium tender, juicy, sweet. Medium late. A white-wine type utilized in sherry manufacture. Not widely planted but adapted to central sections of region 9.

PETIT BOUSCHET.—Origin, France. Vine medium in vigor, productive; spur pruning required. Flowers self-fertile. Clusters medium in size, conical, shouldered, medium to compact. Berries black, medium in size, spherical. Skin medium thin, tender. Pulp soft, juicy; red juice. Early midseason. A red-wine type not extensively grown. Adapted to region 9.

PETITE SYRAH.—Also known as Duriff and Serine. Origin, France. Vine medium in vigor, productive; spur pruning required. Flowers self-fertile. Clusters medium to small, cylindrical, frequently winged, compact. Berries black, medium to small, spherical to slightly ellipsoidal. Skin medium thin. Pulp soft, juicy. Midseason. An important red-dry-wine type quite widely grown but more adapted to cooler sections of region 9.

PRUNE DE CAZOULS.—Origin, France. Vine vigorous, very productive; spur pruning required. Flowers self-fertile. Clusters medium in size, conical, shouldered, medium, compact. Berries purple black to black, large ovoid to elongated, occasionally slightly truncate. Skin thick, fairly tough. Pulp firm, meaty, sweet. Midseason to late. A table and shipping type. Not extensively grown but rather widely adapted in region 9. Also reported as succeeding in vinifera locations of other regions.

REFOSCO.—Also known as Crabb Black Burgundy. Origin, Italy (?). Vine vigorous, productive; either spur or short-cane pruning satisfactory. Flowers self-fertile. Clusters medium loose but well-filled. Berries black, medium to below medium in size, ovoid to spherical. Skin medium thick, tender. Pulp medium firm, juicy, sweet. Midseason wine grape. Widely adapted. Mainly grown in cooler sections of region 9.

SAINT MACAIRE.—Origin, France (?). Vine medium in vigor, productive; either spur or short-cane pruning satisfactory. Flowers self-fertile. Clusters medium in size, short cylindrical, shouldered, variable, loose to fairly compact. Berries black, ovoid to ellipsoidal. Skin medium thick. Pulp medium soft, juicy, sweet, with rather high acidity. Midseason to slightly later. A red-dry-wine type. Widely grown but not in large quantities. Grows better in moderately cool sections of region 9.

SALVADOR.—Origin unknown; probably a vinifera cross. Vine medium in vigor, very productive; either spur or cane pruning satisfactory. Flowers self-fertile. Clusters small, short cylindrical, occasionally slightly shouldered, very compact. Berries black, small spherical to slightly ellipsoidal, pressed out of shape in cluster. Skin medium thin, fairly tough. Pulp soft, juicy; intensely red juice. Midseason to slightly later. Mainly a type for coloring wine; may need cane pruning and training on wire trellis to obtain tonnage production. Has been grown in warmer locations and interior valleys of region 9. Not extensively planted.

SEMILLON.—Origin, France. Vine vigorous, productive; spur or short-cane pruning required. Flowers self-fertile. Clusters medium in size, cylindrical, rather broadly shouldered, medium compact (fig. 4, *B*). Berries light yellowish green, medium in size, spherical. Skin thin, tender. Pulp soft, juicy, sweet. Midseason to late. An important white-dry-wine type and the main variety used in sauterne-type wine. Appears widely adapted but more generally grown in moderate and cooler sections of region 9.

SULTANA.—Origin, Persia (?). Vine vigorous, productive; either spur or cane pruning satisfactory. Flowers self-fertile. Clusters very large, irregular, cylindrical, heavily shouldered, medium compact. Berries light greenish yellow to yellow, spherical to slightly oblate. Skin thin, tough. Pulp medium, tender, juicy, seedless, with occasionally rudimentary seed coats. Medium to slightly early. Mainly a seedless raisin type. When grown in the cooler locations also used as a white-dry-wine type. Widely adapted; ranks third as a raisin grape but declining in importance. Mainly grown in warm central part of region 9.

SULTANINA.—Also known as Thompson Seedless. Origin, Persia (?). Vine vigorous, very productive; cane pruning required. Flowers self-fertile. Clusters large, long, cylindrical, heavily shouldered, medium to compact (fig. 4, *C*).

Berries light to golden yellow, below medium in size, elongated ellipsoidal to oblong. Skin thin, medium tough. Pulp firm, medium tender, sweet, sprightly in flavor. Early. The leading seedless table, raisin, and shipping grape. When used as a shipping grape, annual ringing is practiced to increase berry size and improve adherence of berries to cluster. When planted on different soil types, harvesting extends over a long period. May be held for a limited period in cold storage for later shipment. Constitutes approximately one-third of the vinifera grape acreage in the United States. Widely adapted but mainly planted in warmer sections of region 9.

SYLVANER.—Also known as Franken Riesling. Origin, Australia (?). Vine vigorous, productive; either spur or cane pruning satisfactory. Flowers self-fertile. Clusters small, short cylindrical, slightly shouldered, very compact. Berries dark green to light greenish yellow, small, nearly spherical, pressed out of shape in compact cluster. Skin thick, tough; many prominent dots. Pulp soft, juicy, sweet. Medium early. A white-dry-wine type. Formerly planted in the warm interior central valley of region 9 for wine making and, on account of its early ripening, for distilling material. In this location, cane pruning is necessary to obtain sufficient crop. Now mainly grown, but not extensively, in cooler coastal and northern sections of region 9. Reported as succeeding in sections of region 8.

TANNAT.—Origin unknown. Vine medium in vigor, productive; spur pruning required. Flowers self-fertile. Clusters medium in size, cylindrical, shouldered, compact. Berries black, below medium in size, ovoid to ellipsoidal. Skin medium thick. Pulp soft, juicy, rather high both in sugar and acid. Midseason. A red-dry-wine type. Not extensively planted. Appears adapted to moderately warm sections of region 9.

TROUSSEAU.—Origin, Portugal or France (?). Vine very vigorous, productive; spur or short-cane pruning required. Flowers self-fertile. Clusters small, short conical to cylindrical, slightly shouldered. Berries grayish to black, small, ovoid to ellipsoidal. Skin fairly thick and tough. Pulp medium firm, juicy, sweet; low acidity. Early midseason. A port-wine type; lacks red color. Not extensively planted. Adapted to warmer sections of region 9.

VALDEPENAS.—Origin, Spain. Vine vigorous, productive; spur pruning required. Flowers self-fertile. Clusters medium in size, cylindrical, rather heavily shouldered, well-filled to compact. Berries black, medium in size, variable in size, spherical to oblate. Skin medium thick. Pulp firm but juicy, sweet. Early midseason. A red-wine type. Not extensively planted but has wide adaptation from warm valleys to cooler sections of region 9.

VERDAL.—Also known as Asperin Blanc and Servan Blanc. Origin, France. Vine very vigorous, very productive; spur pruning required. Flowers self-fertile. Clusters large, conical, shouldered, well-filled but not tightly compact. Berries light green, large, spherical. Skin medium thin, rather tender. Pulp medium soft; neutral flavor. Late. A white table and local-market grape. Not extensively grown. Adapted to moderately warm sections of region 9.

ZINFANDEL.—Origin unknown. Vine medium in vigor, very productive; spur pruning required. Flowers self-fertile. Clusters medium in size, cylindrical, shouldered to winged, compact to very compact. Berries black, medium in size, spherical to short ellipsoidal. Skin medium thin, fairly tender. Pulp soft, juicy, sweet. A red-wine type. The leading wine grape in acreage and production in California. Utilized in the warmer locations for port-wine types and in the cooler valleys for red-dry-wine types. Widely adapted in region 9 and reported as succeeding in vinifera locations of regions 7 and 8.

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